## INITIAL GEOTECHNICAL EVALUATION EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

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January 4, 2002 Project No. 600198001



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Mr. Barry Ling, P.E. Kirkham Michael Consulting Engineers 9210 North 25<sup>th</sup> Avenue, Suite 195 Phoenix, Arizona 85021

Subject:

Initial Geotechnical Evaluation

East Maricopa Floodway

Chandler Heights Detention Basin

Maricopa County, Arizona

#### Dear Mr. Ling:

In accordance with our proposal dated May 7, 2001 and your authorization to proceed dated June 7, 2001, Ninyo & Moore has performed an Initial Geotechnical Evaluation for the above-referenced site. The attached report represents our methodology, findings, conclusions, and pre-liminary recommendations regarding the geotechnical conditions at the project site.

We appreciate the opportunity to be of service to you during this phase of the project. If you have any questions or comments regarding this report, please call at your convenience.

Sincerely,

NINYO & MOORE

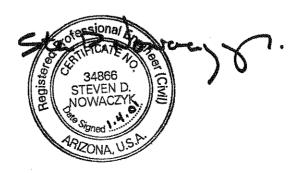
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#### 1. INTRODUCTION

In accordance with our proposal dated May 7, 2001 and your authorization to proceed dated June 7, 2001, we have performed a geotechnical evaluation for the Chandler Heights Detention Basin project located in eastern Maricopa County, Arizona. The purpose of our evaluation was to assess the subsurface conditions at the project site in order to formulate geotechnical recommendations for design and construction of the new basin. This report presents the results of our evaluation and our geotechnical conclusions and recommendations regarding the proposed construction.

#### 2. SCOPE OF SERVICES

The scope of our services for the project generally included the following:

- Reviewing readily available aerial photographs and published geologic literature, including maps and reports pertaining to the project site and vicinity.
- Marking-out the boring locations and notifying Arizona Blue Stake of the boring locations prior to drilling.
- Drilling, logging, and sampling 26 small-diameter exploratory borings to depths of about 16 to 33 feet below ground surface (bgs). The boring logs are presented in Appendix A.
- Excavating, logging, and sampling three test pit explorations to depths of about 12 feet bgs. The test pit logs are also presented in Appendix A.
- Performing six field infiltration tests at the anticipated bottom-of-basin level, in general accordance with the City of Chandler method. The results of this testing are presented in Appendix C.
- Installing three piezometers in boreholes that were drilled along the East Maricopa Floodway (EMF).
- Performing laboratory tests on selected samples obtained from the borings to evaluate in-situ moisture content and dry density, grain size analysis, Atterberg limits, hydro-consolidation (swell/collapse) tests, maximum density/optimum moisture relationship, expansion index, agronomic testing (growability), permeability tests, unconsolidated undrained Triaxial Compression tests and corrosivity characteristics (including pH, minimum electrical resistivity, soluble sulfates, and chlorides). The results of the laboratory testing are presented on the logs in Appendix A and/or the laboratory sheets present in Appendix B. The results from the agronomic testing are presented in Appendix D.

• Preparing this initial report that presents our findings, conclusions, and preliminary recommendations regarding the design and construction of the new basin.

#### 3. SITE DESCRIPTION

The project site is located in Sections 15 and 22 of Township 2 South, Range 6 East. The project area covers approximately 320 acres of land and is situated in the Town of Gilbert, Arizona. The project area is bounded by Higley Road to the east, Queen Creek Road to the north, Queen Creek Wash to the southwest, and the EMF to the west, and is depicted on the Site Location Map (Figure 1).

At the time of our evaluation, the project area was vacant. Farming apparently occurred on the site in the past, particularly in its northern and extreme southern portions. Scattered trees, small brush, and weeds were observed during our site visits. In addition, several unpaved roads randomly crossed the site, although there were several unpaved roads that are on east-west alignments. One of these appeared to coincide with the alignment of Ocotillo Road in the south-central portion of the project area and is also coincident with an existing east-west aligned fence line. Some scattered piles of soil were also observed. We understand that some spoils from the original construction of the EMF were dumped and spread out over the northern portion of this site.

According to the *Higley, Arizona 7.5-Minute USGS Topographic Quadrangle Map (1981)*, the project area lies at an average elevation of roughly 1,315 feet relative to mean sea level (MSL). Based on the information from these quadrangle maps and the topographic information we obtained from your office, it appears the project area slopes very gently from the east to the west, toward the EMF, with a vertical relief of less than 10 feet.

Two aerial photographs were reviewed for this project. A 1967 photograph from the USDA Soil Survey of Eastern Maricopa and Northern Pinal Counties, Arizona indicated a denser vegetation and small shrubs across the central and northern portion of the project area than exists at the site presently. In addition, a small area of row crops is recorded in the same photograph near the extreme southern tip of the project area. A series of 1999 aerial photographs from Landiscor's

Phoenix Real Estate Photo Book show the project area similar to its current condition. Our evaluation of the aerial photographs and visual reconnaissance did not indicate any large disturbed areas that might be indicative of past development or filling. We also observed some public use of recreational vehicles during our field activities within the project area, with associated trails tracking across the project area.

#### 4. PROPOSED CONSTRUCTION

The project generally includes the construction of a new detention basin along the southeast side of the EMF, from Queen Creek Road to just north of Chandler Heights Road. The basin will collect runoff from Queen Creek and Sanokai Wash, temporarily retain the water and ultimately discharge it into the EMF. The basin elevation will vary from about 1,300 feet above MSL near the north side, to about 1,296 feet above MSL near the south side. Consequently, the excavations needed to create the basin area will extend to about 10 to 20 feet bgs. Natural soil berms, which will act as a levees, will be created (from the excavation) between the basin and the EMF and Queen Creek. Based on our conversations with Kirkham Michael Consulting Engineers and the Flood Control District of Maricopa County, we understand that this construction is not considered a jurisdictional dam because the impounded water will be situated below to existing ground surface.

A segment of the Queen Creek channel, from its crossing under Higley Road to the existing sedimentation basin to the north of Chandler Heights Road, will be improved. Specifically, Queen Creek will be widened to 100 feet from Higley Road to about the alignment of Ocotillo Road. Immediately to the south of the Ocotillo Road alignment, Queen Creek will be widened to 200 feet and then gradually taper over about 2,500 linear feet to a channel width of 70 feet. This width will be maintained until it terminates into the sedimentation basin. The vertical alignment of the creek bottom will also be improved. From Higley Road to the Ocotillo Road alignment, there will be four drop structures, each 3 feet high, that will lower the level of the creek from about 1,315 to 1,303 feet above MSL. As a result of the improvements to Queen Creek, some of the natural soil berm created between Queen Creek and the EMF, specifically about the top 2 to 3

feet, will extend above the existing ground surface. This portion of the levee will be constructed of new engineered fill.

The sediment basin at the end of Queen Creek will be re-shaped to accommodate the anticipated water volumes. The existing sediment basin outflow, located near the southwest corner of the basin, will be replaced with 13, 4 feet wide by 4 feet high concrete box culverts (CBC). The discharge of these CBCs will be controlled with one-way flap gates.

A 1,800-foot long, concrete side weir will be constructed along the northwest side of Queen Creek, specifically where it tapers from 200 feet to 70 feet wide. This side weir will enable water to enter the basin from Queen Creek. The side weir crest elevation is tentatively planned to be at about 1,307 feet above MSL.

To allow the water to transfer into the EMF, two outlets are planned. One outlet will be located near the southwestern tip of the basin and will consist of 12, 4 feet wide by 4 feet high CBCs. This outlet will be controlled with manual gates. The other outlet will be located about 2,700 feet south of the EMF intersection with Queen Creek Road and will consist of 13, 4 feet wide by 4 feet high CBCs. This outlet will be controlled with one-way flap gates.

Two emergency spillways will be constructed. One will be located between the new basin and the EMF, near the southwestern most tip of the basin (just north of the new outlet structure), and the other will be located between the sediment basin and the EMF. These emergency spillways will consist of concrete-surfaced embankments.

The side slopes around the perimeter of the basin are proposed to be constructed with a 4 vertical to 1 horizontal slope. The land use within the new basin is tentatively planned to accommodate multiple-use facilities, and could include several baseball and soccer fields. A small portion of the basin located along the Ocotillo Road alignment will not be excavated. This area is reserved for future roadway development.

#### 5. FIELD EXPLORATION

#### 5.1. Soil Borings

Ninyo & Moore conducted a subsurface evaluation at the site between July 11 and July 19, 2001 in order to evaluate the existing subsurface conditions and to collect soil samples for laboratory testing. Our evaluation consisted of the excavating, logging, and sampling of 26 small-diameter borings. The borings were drilled using a CME-75 truck-mounted drill rig. Of these borings, ten were drilled along the EMF perimeter (denoted as CH-11 through CH-10), nine were drilled along the Queen Creek perimeter (denoted as CH-11 through CH-19), one was drilled along the Queen Creek Road perimeter (denoted as CH-20), and six were drilled within the new basin area (denoted as CH-21 through CH-26). Bulk and relatively undisturbed soil samples were collected at selected intervals. Detailed descriptions of the soils encountered are presented in the boring logs in Appendix A.

The ground surface elevations and the lateral locations at each boring were determined by Consultant Engineering, Inc of Phoenix, Arizona, after the drilling was finished. The elevations of each boring location are presented on the logs. The general locations of each of the borings are denoted on the Soil Boring Location Map (Figure 2).

#### 5.2. Test Pits

Ninyo & Moore conducted a supplemental subsurface evaluation consisting of the excavation of three test pits on November 26 and 27, 2001 in order to further evaluate the existing subsurface conditions. The test pits were excavated along the EMF perimeter using a Ford 555E backhoe. Detailed descriptions of the soils encountered are presented in the boring logs in Appendix A, and the general locations of the test pits are denoted on Figure 2.

#### 5.3. Piezometer Monitoring Wells

In order to monitor surface water seepage from the EMF after a large rain event, three of the boreholes were completed as piezometers. Specifically, the piezometers were installed in borings CH-2, CH-6, and CH-9. In general, the bottom half of the piezometer well casing

consisted of bottom capped screened PVC, and the top half solid impermeable PVC. The annuli around the wells were backfilled with permeable sand and grouted near the ground surface using cement-bentonite slurry. The above ground exposures of the well casings were enclosed and capped with an above-ground lockable protective steel casing.

No substantial rainfall occurred during our study period and no meaningful readings were taken; however, the wells were left in-place. Consequently, if a heavy sustained rain event occurs during the final design phase, the piezometers may be read and the information could be useful.

#### 5.4. Field Percolation Tests

In order to provide a preliminary evaluation of the infiltration rate near the bottom of the proposed basin, Ninyo & Moore conducted six infiltration tests in general accordance with the City of Chandler Typical Detail No. C-109. This method was selected because it is commonly considered to be a standard throughout metropolitan Phoenix. These tests were performed near the central portion of the proposed basin at the site, adjacent to borings CH-21, CH-22, CH-23, CH-24, CH-25, and CH-26. The procedures used consisted of the insertion of a 12-inch diameter solid riser into undisturbed soil, to a depth of approximately 15 to 20 feet bgs, followed by prewetting of the soil. The test continued after the prewetting period by refilling the casing and monitoring the drop in water level as a function of time until steady-state conditions were achieved. The results of this testing are provided in Appendix C.

## 5.5. Field Screening for Volatile Organic Compounds (VOCs)

In order to provide a preliminary screening of soil for the possible presence of volatile organic compounds (VOCs), several collected samples were tested in the field as drilling progressed with a photoionization detector (PID). The Mini-Rae PID was calibrated at the beginning of each sampling day with 100 ppm isobutylene span gas. A zip-lock plastic bag was partially filled with a portion of each collected soil sample, sealed, the soil disturbed,

and allowed to volatilize for 10 minutes. The tip of the PID was then inserted into the head-space of the plastic bag.

The highest PID reading was noted and recorded on the field boring logs and in the field notebook. No elevated VOC readings were observed during our field work.

#### 6. LABORATORY TESTING

The soil samples collected from our drilling activities were transported to the Ninyo & Moore laboratory in Phoenix, Arizona for geotechnical laboratory analysis. The analysis included in-situ moisture content and dry density, grain size analysis, Atterberg limits, hydro-consolidation (swell/collapse) tests, maximum density/optimum moisture relationship, expansion index, agronomic testing (growability), permeability tests, unconsolidated undrained Triaxial Compression tests and corrosivity characteristics (including pH, minimum electrical resistivity, soluble sulfates, and chlorides). The results of the laboratory testing are presented on the logs in Appendix A and/or the laboratory sheets present in Appendix B.

Agronomic testing consisting of the testing of primary nutrients, secondary nutrients, micro nutrients, as well as other agricultural characteristics, was performed by Fruit Growers Laboratory, Inc. of Santa Paula, California. The results of these tests, which include planting recommendations, are presented in Appendix D.

#### 7. GEOLOGY AND SUBSURFACE CONDITIONS

The geology and subsurface conditions at the site are described in the following sections.

#### 7.1. Geologic Setting

The project site is located in the Sonoran Desert Section of the Basin and Range physiographic province, which is typified by broad alluvial valleys separated by steep, discontinuous, subparallel mountain ranges. The mountain ranges generally trend north-

south and northwest-southeast. The basin floors consist of alluvium with thickness extending to several thousands of feet.

The basins and surrounding mountains were formed approximately 10 to 13 million years ago during the mid- to late-Tertiary. Extensional tectonics resulted in the formation of horsts (mountains) and grabens (basins) with vertical displacement along high-angle normal faults. Intermittent volcanic activity also occurred during this time. The surrounding basins filled with alluvium from the erosion of the surrounding mountains as well as from deposition from rivers. Coarser-grained alluvial material was deposited at the margins of the basins near the mountains. The surficial geology of the proposed detention basin is described as latest Quaternary age deposits (<10,000 years old) and Pleistocene deposits (<250,000 years old) consisting of sand, clay, and silt with local occurrences of fine gravels and coarse deposits that contain minimal to moderate soil development (Pearthree, 1994).

#### 7.2. Subsurface Conditions

Our knowledge of the subsurface conditions at the project site is based on our field exploration and laboratory testing, and our understanding of the general geology of the area. The following paragraphs provide a generalized description of the materials encountered. More detailed descriptions are presented on the boring logs in Appendix A.

Stratified desert alluvium was encountered at the surface of the borings and extended to the total depth explored. The alluvium consisted of clay (CL), silt (ML), clayey/silty sand (SC/SM) and clayey/silty fine to coarse gravel (GP/GC/GM). Scattered caliche nodules, filaments, and stringers were present in many of the borings. Table 1 provides a breakdown of the soil types encountered in our borings within the proposed basin excavation (e.g., from the ground surface to about 10 to 20 feet bgs):

Table 1 – Approximate Percentage of Soil Types Encountered from Ground Surface to Anticipated Bottom of Basin

GP/GC/GM	SP	SC/SM	ML	CL
2%	0%	16%	7%	75%

Table 2 provides a breakdown of the soil types encountered in our borings at the anticipated bottom of the basin excavation (e.g., about 10 to 20 feet bgs):

Table 2 – Approximate Percentage of Soil Types Encountered at the Anticipated Bottom of Basin Excavation

GP/GC/GM	SP	SC/SM	ML	CL
8%	0.70   0.20		8%	34%

The geological characteristics of the surface soils within the project site generally includes the presence of a Holocene "apron" overlying an older Late Pleistocene deposit. The Holocene deposits are typically of lower density and are relatively susceptible to collapse upon wetting. Consequently, the position of the contact between the Holocene and Late Pleistocene deposits is relevant. Based on our field work and laboratory testing, we estimate that this contact ranges from about elevation 1,286 to 1,308 feet MSL. Localized variations may be greater than the given range and are largely attributable to erosion of the Late Pleistocene surface.

#### 7.3. Groundwater

Groundwater was not encountered in our boring excavations. Based on well data from the Arizona Department of Water Resources (ADWR), the approximate depth to groundwater is in excess of about 180 feet bgs. Groundwater levels can fluctuate due to seasonal variations, irrigation, groundwater withdrawal or injection, and other factors. In general, groundwater is not expected to be a constraint to the construction of the project; however, given the occurrence of relatively pervious zones, perched tailwater resulting from flood irrigation of cropland might be encountered.

#### 8. CONCLUSIONS

Based on the results of our subsurface evaluation, laboratory testing, and data analysis, it is our opinion that the proposed construction is feasible from a geotechnical standpoint, provided that

the preliminary recommendations of this report are incorporated into the design and construction of the proposed project, as appropriate. Geotechnical considerations include the following:

- The on-site soils consist of stratified desert alluvium with a high degree of heterogeneity and anisotropy. The soils should generally be excavatable to planned depths with conventional earthmoving construction equipment in good working condition.
- A basin side slope angle of 4 horizontal to 1 vertical is feasible from a geotechnical standpoint. Our calculations show an acceptable factor of safety against appropriate failure modes.
- Of primary concern is the possibility of cracking, piping, and/or seepage through the natural levees. These concerns were addresses in the Failure Mode Analysis (FMA) performed for this project. As a result, one of the primary conclusions was that a crack-stopper barrier (located within the levee between the basin and the EMF and Queen Creek) would alleviate several of the potential failure modes discussed.
- We recommend that the side weir (and possibly the emergency spillway) be supported on a zone of engineered fill that extends through the Holocene alluvium soils to older Pleistocene deposits. Based on our field work, we estimate that the contact between the Holocene and Pleistocene deposits range from about elevation 1,286 to 1,308 feet MSL at the boring locations.
- Anti-seepage devices, like seepage collars, should be used for the installation of pipes or other penetrations that cross through or beneath the levees

#### 9. PRELIMINARY RECOMMENDATIONS

The following sections present our preliminary geotechnical recommendations for the proposed basin construction. We anticipate that more detailed recommendations will result from an additional design-phase geotechnical evaluation.

#### 9.1. Earthwork

The following sections provide our earthwork recommendations.

#### 9.1.1. Excavation Characteristics

Our evaluation of the excavation characteristics of the on-site materials is based on the results of 26 widely spaced exploratory borings and three test pits, our site observations, and our experience with similar materials. In our opinion, excavation of the on-site

materials can generally be accomplished to the anticipated basin depth with conventional earthmoving equipment in good operating condition. However, scattered caliche nodules, filaments, and stringers were encountered in many of the borings, which may be somewhat more time-consuming to excavate. This cementation predominates in the older Pleistocene deposits, which were encountered below roughly elevation 1,286 to 1,308 feet MSL.

We recommend that trenches and excavations be designed and constructed in accordance with OSHA regulations. These regulations provide trench sloping and shoring design parameters for trenches up to 20 feet deep based on a description of the soil types encountered. Trenches greater than 20 feet deep should be designed by the Contractor's engineer based on site-specific geotechnical analyses. For planning purposes, we recommend that the OSHA soil classification for the encountered alluvial soil be considered as Type C.

#### 9.1.2. Grading, Fill Placement, and Compaction

Vegetation and debris from the clearing operation should be removed from the site and disposed of at a legal dumpsite. Demolition debris should be removed from the site and disposed of at a legal dumpsite. Obstructions that extend below finish grade, if present, should be removed and the resulting holes filled with compacted soil.

A geotechnical consultant should carefully evaluate areas of soft or wet soils prior to placement of fill or other construction. Drying or overexcavation and replacement of such materials may be anticipated.

We recommend that new fill be placed in horizontal lifts approximately 8 inches in loose thickness and compacted by appropriate mechanical methods, to 95 percent or more relative compaction, in accordance with ASTM D 698-91 at a moisture content within two percent of its above optimum.

Based on the laboratory tests we performed, it appears that an earthwork (shrinkage) factor of 5 to 25 percent is appropriate for the on-site soils within the basin area. This shrinkage factor range represents an average of the material tested. Potential bidders should consider this in preparing estimates and should review the available data to make their own conclusions regarding excavation conditions.

Although not apparent in our logs, because much of this site was used for farming, the top 6 to 12 inches may contain some organics. This layer may need to be segregated during construction and could be reused in non-structural area of the site.

#### 9.1.3. Reuse of Excavated Material as Borrow

The composition of the soils that will likely be excavated for construction of the basin was outlined in Section 7.2. In addition to the index testing (grain size analysis and Atterberg limits) that was conducted to classify these soils, we performed Expansion Index and corrosivity tests as a means to evaluate these soils for potential reuse. Table 3 outlines the results of these tests. Given the very large volume of soil to be excavated and the heterogeneous nature of the natural soils, wider variations in soil characteristics than suggested by these results are possible.

Table 3 – Summary of Expansion Index and Corrosivity Test Results

Sample Location	Sample Depth (ft)	Expansion Index	рН	Resistivity (ohm-cm)	Water-Soluble Sulfate Content in Soil (%)	Chloride Content (ppm)
CH-11	0-2	1.5	7.6	508	0.0025	160
CH-21	12-15	6	8.4	1,320	0.0004	10
CH-23	0-2	1.5				
CH-25	12-15	0				

The Expansion Index test is used to evaluate the intrinsic swell or expansion potential of a remolded soil sample upon saturation with water. Based on Uniform Building Code (UBC) Standard No. 18-2, an Expansion Index from 0 to 20 indicates a very low expansion potential, 21 to 50 indicates a low expansion potential, 51 to 90 indicates a medium expansion potential, 91 to 130 indicates a high expansion potential, and 130 or above

indicates a very high expansion potential. The soils that we tested exhibited a very low expansion potential.

The pH and minimum electrical resistivity tests were performed in general accordance with Arizona Test 236b, while sulfate and chloride tests were performed in accordance with Arizona Test 733 and 722, respectively. The soil pH values ranged from 7.6 to 8.4, which is considered to be alkaline. The minimum electrical resistivity measured in the laboratory varied from 508 to 1,320 ohm-cm, which is considered to be corrosive to ferrous materials. The chloride content of the sample tested ranged from about 10 to 160 ppm, which is also considered to be corrosive to ferrous materials.

Based on the UBC criteria, the potential for sulfate attack is negligible for water-soluble sulfate contents in soil ranging from 0.00 to 0.10 percent by weight (0 to 1,000 ppm), and moderate for water-soluble sulfate contents ranging from 0.10 to 0.20 percent by weight (1,000 to 2,000 ppm). The potential for sulfate attack is severe for water-soluble sulfate contents ranging from 0.20 to 2.00 percent by weight (2,000 to 20,000 ppm), and very severe for water-soluble sulfate contents over 2.00 percent by weight (20,000 ppm). The soluble sulfate content of the soil samples tested ranged from 0.0004 to 0.0025 percent, which represents a negligible sulfate exposure for concrete.

#### 9.1.4. Imported Fill Material

Imported fill in contact with ferrous materials or concrete, if utilized, should consist of clean, granular material with a very low or low expansion potential. Import material should also have low corrosion potential (minimum resistivity greater than 2,000 ohmom or the average value for the site, chloride content less than 25 parts per million [ppm], and soluble sulfate content of less than 0.1 percent). The geotechnical consultant should evaluate such materials and details of their placement prior to importation.

#### 9.2. Levee Stability and Seepage

The proposed construction of the new basin will create a natural levee along the perimeter of the basin, specifically along the EMF and Queen Creek. Levees are usually constructed with select materials that are placed in an engineered manner and compacted to a specified density. For seepage and piping considerations, constructed levees will ordinarily be zoned and may contain internal drainage, and the embankment foundations are prepared with cut-offs extending below the embankment.

The composition of these natural levees will be highly heterogeneous and anisotropic, and could be subject to differential settlements, cracking, piping and/or seepage concerns. Although not disclosed in our limited sampling program, the natural levees and their foundations likely contain defects such as desiccation cracks, open graded channels, etc. The following sections of the report address construction considerations with regards to the natural levees that will be constructed for this project and also address the basin infiltration that may be expected.

Due to the infrequent and transient nature of water storage and flow in the abutting channels, the levee soils, constructed as proposed, will remain dry and (in some cases) brittle until a wetting front passes through during flood events. Given the short impoundment time, seepage through these levees is not expected to reach steady-state conditions.

#### 9.2.1. Side Slope Stability

Based on our conversations with your office and the conceptual plans we were given, we understand that the preliminary design of the side slopes around the perimeter of the basin calls for a 4 (horizontal) to 1 (vertical) slope. We performed preliminary slope stability analyses on a typical embankment section with this slope. The stability analyses were done using the computer program PCSTABL6H, which is a static and pseudostatic stability program using Bishop's modified circular failure surfaces. Based on the results of this analysis, we have calculated a factor of safety against failure in excess of 2.0. In establishing this factor of safety, we assumed very conservative embankment soil parameters and a total stress analysis. Because saturated conditions

are not anticipated (except for the faces of the levees), rapid drawdown stability scenarios have been ruled out as highly unlikely.

On the basis of these analyses, we believe that the proposed 4:1 slope is feasible from a geotechnical standpoint. A graphical representation of this slope stability analysis is given in Figure 3.

#### 9.2.2. Piping and Seepage

Because these natural levees will be constructed of native soils that are highly heterogeneous and not placed in a controlled manner, differential settlements, desiccation cracking, piping and seepage from the basin to the EMF and Queen Creek (or vice versa) are major design considerations. To better understand these and other potential risks associated with this type of construction, a failure mode assessment (FMA) was conducted for this project.

The outcome of this FMA will be summarized in a Failure Mode Report, which will be prepared by Kirkham Michael Consulting Engineers. One of the major findings revealed in this process was that a crack-stopper barrier (located within the levee between the basin and the EMF and Queen Creek) would alleviate several of the potential failure modes discussed, particularly those associated with differential settlement, cracking, piping and seepage. Detailed discussions and recommendations for crack-stopper barrier construction, including cost analysis and comparisons, will be provided in the final geotechnical report.

## 9.2.3. Self-Weight Settlement of Levee and Basin Floor

As mentioned earlier, the project site is generally underlined with a Holocene "apron" overlying an older Late Pleistocene deposit. The Holocene deposits are typically of lower density and are relatively susceptible to collapse, under their own self-weight, upon wetting. If this settlement occurs under or within the levee, cracks may develop. As with the piping and seepage concerns discussed in the previous section, defensive measures like a crack-stopper barrier may alleviate this situation as well.

In addition, self-weight settlement within the basin may also occur, with the cracks that develop generally limited to the basin floor. As a result, a low spot could be created and the capacity of the basin may be locally affected. However, the overall performance of the basin as a result of this potential localized settlement will most likely not be compromised.

#### 9.2.4. Basin Base Infiltration

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As mentioned earlier, four field percolation tests were performed for this basin. The tests were located within the central portion of the proposed basin area and extended to about 15 to 17 feet bgs. Table 4 summarizes these results of these percolation tests.

Test Location	Test Depth (ft)	Average Percolation Rate (ft³/hr/ft²)	Soil Type at Test Depth
near CH-21	20	0.91	SM
near CH-22	20	0.33	CL
near CH-23	15	0.10	CL
near CH-24	20	0.30	CL
near CH-25	20	0.13	SM

Table 4 - Summary of Percolation Tests Within Chandler Heights Basin

The reported values should be viewed as highly approximate since soil permeability is among the more variable quantities used in soil mechanics. A conservative approach to seepage rates is recommended.

0.07

#### 9.3. New Levee Construction

near CH-26

As a result of the proposed improvements to Queen Creek, some of the natural levee created between Queen Creek and the EMF, specifically about the top 2 to 3 feet, will extend above the existing ground surface. Consequently, this layer will be engineered and compacted in lifts.

We recommend that the new fill needed for this top segment of the levee be placed in horizontal lifts approximately 8 inches in loose thickness and compacted by appropriate

**GM** 

mechanical methods, to 95 percent or more relative compaction, in accordance with ASTM D 698-91, at a moisture content within two percent of its optimum. Selected low permeability on-site soils could be reused for this purpose. We recommend that this segment be keyed into the native soils.

#### 9.4. Side Weir and Outlet Works

As mentioned earlier, we understand that a 1,800-foot long, concrete side weir will be constructed along the northwest side of Queen Creek, specifically where it tapers in width from 200 feet to 70 feet. The side weir crest elevation is tentatively planned to be at about 1,307 feet above MSL. To allow the water to transfer into the EMF, three outfalls are planned. These outfalls are proposed to consist of multiple box culverts that will be incorporated into the natural levee, which will be created between the EMF and the new basin.

In addition, we understand that the side weir will be concrete lined on both sides. The Queen Creek side will be slightly battered toward the basin, and the basin side will be stepped. A plunge pool, extending about 4 feet below the bottom of the basin, will be provided near the toe of the side weir on the basin side. The plunge pool will be lined with riprap to mitigate erosion.

The conceptual drawings that we received also show two cut-off walls, located on either side of the side weir and extending about 6 feet below the bottom of the basin. We understand that these walls were employed to discourage undermining of the side weir by water flow, but will also provide a measure of piping and seepage control.

#### 9.4.1. Foundation Preparation

As part of our scope of work, the characteristics of the foundation soils supporting the new levees were evaluated. Particularly, the extent of a Holocene "apron" overlying the older Late Pleistocene deposits was considered. The Holocene deposits are typically of lower density and are relatively susceptible to collapse upon wetting. Consequently, the position of the contact between the Holocene and Late Pleistocene deposits is relevant.

In our evaluation of the Holocene/Late Pleistocene contact, the qualitative description of cementation stage proposed by Machette (1985) was used in conjunction with that proposed by Beckwith and Hanson (1982). The various stages of cementation are denoted on the logs in Appendix A. Based on our field work and laboratory testing, we estimate that this contact ranges from about elevation 1,286 to 1,308 feet MSL. Localized variations are largely attributable to erosion of the Late Pleistocene surface.

Relevant geologic information was shared during the FMA workshop. As a result, the presence of Holocene soils below the side weir and the potential collapse of these soils was considered a potential failure mode and also a major finding. Consequently, it was recommended that the Holocene soils located below the side weir (and possibly the emergency spillway) should be removed and replaced with compacted, engineered fill.

As mentioned earlier, the thickness of the Holocene apron varies considerably across the project site. Therefore, the anticipated depth of removal for the construction of the side weir should be further evaluated during the design phase of this project. This further evaluation should consist of more closely-spaced borings and/or test pits and additional laboratory testing.

Engineered fill should be placed in horizontal lifts approximately 8 inches in loose thickness and compacted by appropriate mechanical methods, to 95 percent or more relative compaction, in accordance with ASTM D 698-91 at a moisture content within two percent of its optimum moisture content. Selected low permeability, on-site soils could be reused for this purpose.

#### 9.4.2. Pipe Penetrations

An embankment breech can result from inadequately designed or constructed pipelines, utility conduits, or culverts (hereafter referred to as pipes) located beneath or within levees. During high water, seepage tends to concentrate along the outer surface of pipes resulting in piping (potential washing out) of fill or foundation material. Seepage may also occur because of leakage from the pipe. Consequently, we recommend that anti-

seepage devices be employed to mitigate piping or erosion along the outside wall of the pipe. The term "anti-seepage device" usually refers to metal diaphragms or concrete collars that extend from the pipe into the backfill material. The diaphragms and collars are often referred to as "seepage rings". To reduce increased piping potential, great care should be taken when compacting backfill around these seepage rings.

In addition, the pipe should have adequate strength to withstand the applied earth loads. Consideration should also be given to live loads imposed from equipment during construction and the loads from traffic and maintenance equipment after the levee construction.

The pipe joints should be selected to accommodate movements resulting from foundation or fill settlement. In addition, the pipe joints, as well as the pipe itself, should be watertight.

#### 9.4.3. Concrete

As mentioned previously, the results of the sulfate content laboratory tests indicate the site soils present a negligible sulfate exposure to concrete. In accordance with Table 19-A-3 of the 1994 UBC, we believe that Type II cement can be used for the construction of concrete structures at this site. However, due to potential uncertainties as to the use of reclaimed irrigation water, or topsoil that may contain higher sulfate contents, sulfate-resistant cement, pozzalon, or admixtures may be considered.

The concrete should have a water-cement ratio no greater than 0.5 by weight for normal weight aggregate concrete. From a quality standpoint, a 28-day compressive strength of 4,000 psi or higher is desirable because it will improve concrete durability.

#### 9.5. Pre-Construction Conference

We recommend that a pre-construction conference be held. Representatives of the owner, the civil engineer, the geotechnical consultant, and the contractor should be in attendance to

discuss the project plans and schedule. Our office should be notified if the project description included herein is incorrect or if the project characteristics are significantly changed.

#### 9.6. Construction Observation and Testing

During construction operations, we recommend that a qualified geotechnical consultant perform observation and testing services for the project. These services should be performed to evaluate exposed subgrade conditions, including the extent and depth of overexcavation if loose soils are encountered during construction, to evaluate the suitability of proposed borrow materials for use as fill, and to observe placement and test compaction of fill soils. We believe the design geotechnical consultant should be retained for construction services. However, if another geotechnical consultant is selected to perform observation and testing services for the project, we request that the selected consultant provide a letter to the owner, with a copy to Ninyo & Moore, indicating that they fully understand our recommendations and that they are in full agreement with the recommendations contained in this report. Qualified subcontractors utilizing appropriate techniques and construction materials should perform construction of the proposed improvements.

#### 10. LIMITATIONS

The field evaluation, laboratory testing, and geotechnical analyses presented in this geotechnical report have been conducted in general accordance with current practice and the standard of care exercised by geotechnical consultants performing similar tasks in the project area. No warranty, expressed or implied, is made regarding the conclusions, recommendations, and opinions presented in this report. There is no evaluation detailed enough to reveal every subsurface condition. Variations may exist and conditions not observed or described in this report may be encountered during construction. Uncertainties relative to subsurface conditions can be reduced through additional subsurface exploration. Additional subsurface evaluation will be performed upon request. Please also note that our evaluation was limited to assessment of the geotechnical aspects of the project, and did not include evaluation of structural issues, environmental concerns, or the presence of hazardous materials.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader requires additional information or has questions regarding the content, interpretations presented, or completeness of this document.

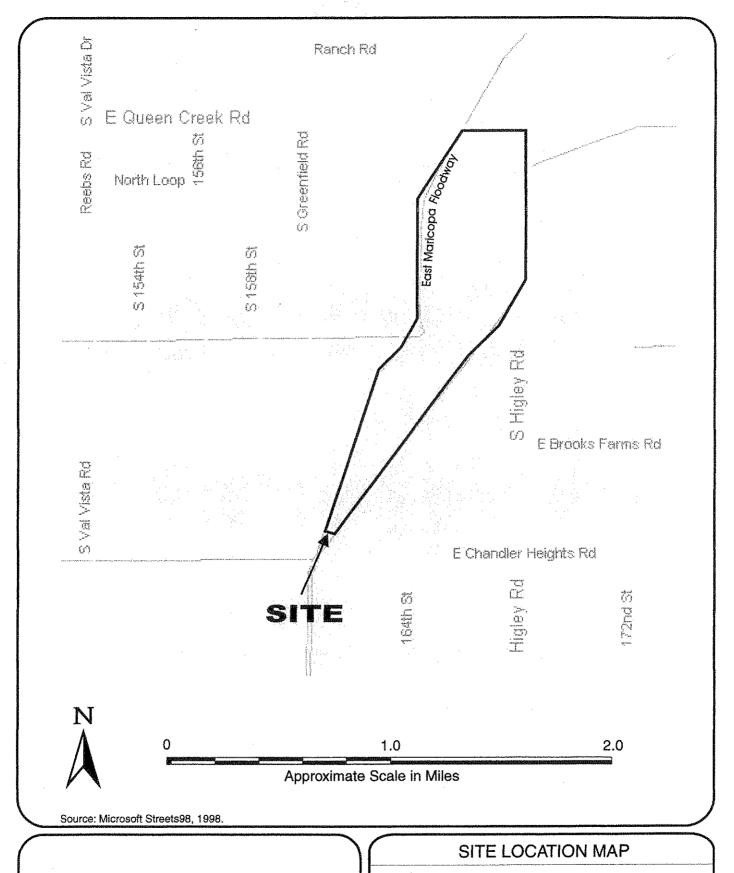
This report is intended for design purposes only and may not provide sufficient data to prepare an accurate bid by some contractors. It is suggested that the bidders and their geotechnical consultant perform an independent evaluation of the subsurface conditions in the project areas. The independent evaluations may include, but not be limited to, review of other geotechnical reports prepared for the adjacent areas, site reconnaissance, and additional exploration and laboratory testing.

Our conclusions, recommendations, and opinions are based on an analysis of the observed site conditions. If geotechnical conditions different from those described in this report are encountered, our office should be notified and additional recommendations, if warranted, will be provided upon request. It should be understood that the conditions of a site could change with time as a result of natural processes or the activities of man at the subject site or nearby sites. In addition, changes to the applicable laws, regulations, codes, and standards of practice may occur due to government action or the broadening of knowledge. The findings of this report may, therefore, be invalidated over time, in part or in whole, by changes over which Ninyo & Moore has no control.

This report is intended exclusively for use by the client. Any use or reuse of the findings, conclusions, and/or recommendations of this report by parties other than the client is undertaken at said parties' sole risk.

#### 11. SELECTED REFERENCES

- American Society for Testing and Materials (ASTM), 1997 Annual Book of ASTM Standards.
- American Society for Testing and Materials (ASTM), 1992, Slurry Walls Design, Construction and Quality Control, ASTM
- Arizona Department of Water Resources (ADWR). Drillers logs in file.
- Beckwith, G. H. and Hansen, L. A., 1982, "Calcareous Soils of the Southwestern United States", Geotechnical Properties, Behavior, and Performance of Calcareous Soils, ASTM STP 777, K. R. Dumars and R. C. Chaney, Eds., American Society for Testing and Materials, p. 16-35.
- Engineered Construction International, Inc., Slurry Trench Cut-Off Walls for Hazardous Waste Isolation
- Harr, M.E., 1962, Groundwater and Seepage, McGraw-Hill Book Company.
- International Conference of Building Officials, 1997, Uniform Building Code: Whittier California.
- Landiscor, 1999, Real Estate Photo Book for the Greater Phoenix Area.
- Machette, M. N., 1985, "Calcic Soils of the Southwestern United States", Soils and Quaternary Geology of the Southwestern United States, Ed. David L. Weide, P. 1-21
- Ninyo & Moore, In-house proprietary information.
- Pearthree, P.A., and Hucklebery, G., 1994, Surficial Geologic Map of the Mesa 30' X 60' Quadrangle, AZ: Arizona Geological Survey, Open-File Report Series OFR 94-24, Scale 1:100,000.
- Terzaghi, K., 1996, Soil Mechanics in Engineering Practice, Third Edition, Wiley Interscience
- United States Department of Agriculture, Soil Conservation Service, 1974 Soil Survey, Eastern Maricopa and Northern Pinal Counties Area, Arizona: dated November 1973.
- United States Army Corps of Engineers, 2000, Design and Construction of Levees.
- Untied States Department of the Interior, Bureau of Reclamation, Design of Small Dams, Third Edition, 1987
- United States Geological Survey, 1981, Higley -Arizona, Maricopa County, 7.5 Minute Series (Topographic): Scale 1" = 24,000'.

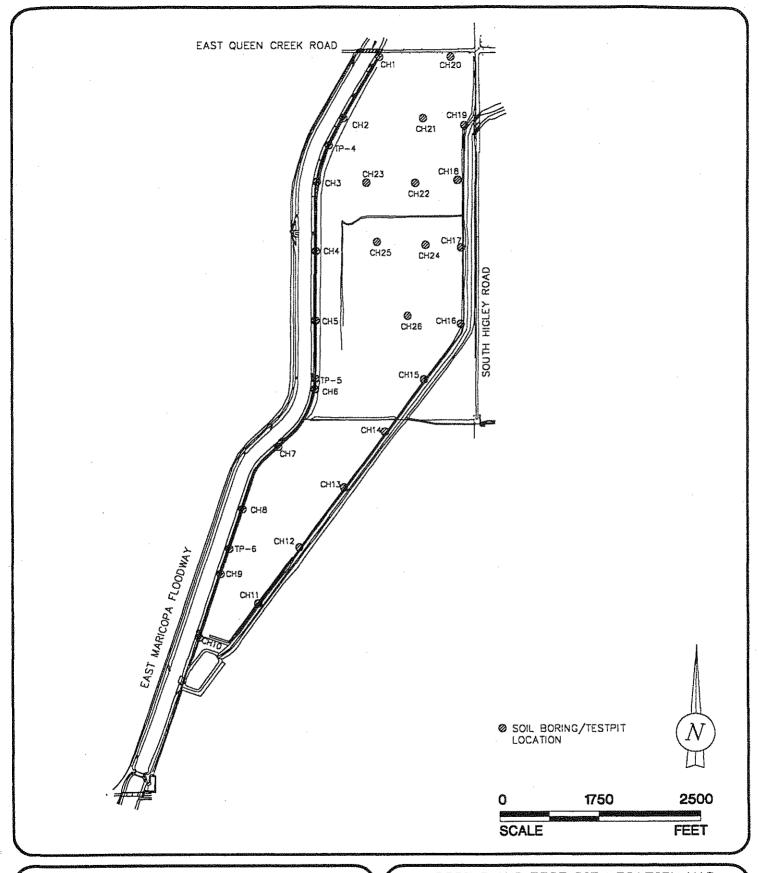


## *Ninyo & Moore*

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

FIGURE



# Minyo & Moore

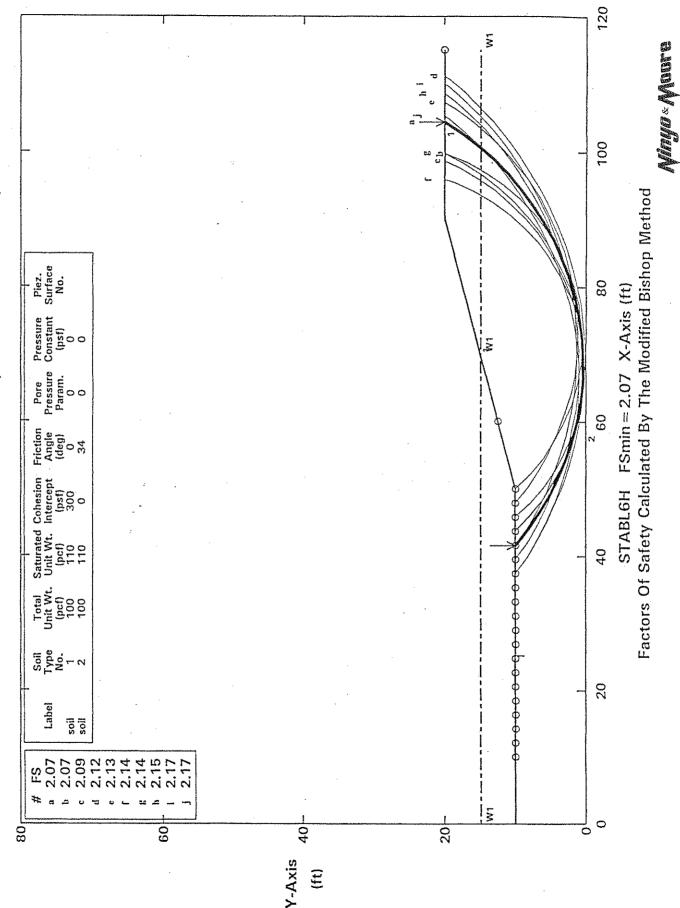
BORING AND TEST PIT LOCATION MAP

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT #	DATE	1
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FIGURE 2

Figure 3: Slope Stability Analysis of Typical Embankment Ten Most Critical. C:EMF-TYP.PLT By: Curt 09-28-01 3:52pm



#### APPENDIX A

#### **BORING LOGS**

#### Field Procedure for the Collection of Disturbed Samples

Disturbed soil samples were obtained in the field using the following methods.

**Bulk Samples** 

Bulk samples of representative earth materials were obtained from the exploratory borings. The samples were bagged and transported to the laboratory for testing.

The Standard Penetration Test Spoon

Disturbed drive samples of earth materials were obtained by means of a Standard Penetration Test spoon sampler. The sampler is composed of a split barrel with an external diameter of 2 inches and an unlined internal diameter of 1-3/8 inches. The spoon was driven up to 18 inches into the ground with a 140-pound hammer free-falling from a height of 30 inches in general accordance with ASTM D 1586-84. The blow counts were recorded for every 6 inches of penetration; the blow counts reported on the logs are those for the last 12 inches of penetration. Soil samples were observed and removed from the spoon, bagged, sealed, and transported to the laboratory for testing.

## Field Procedure for the Collection of Relatively Undisturbed Samples

Relatively undisturbed soil samples were obtained in the field using the following method.

The Modified Split-Barrel Drive Sampler

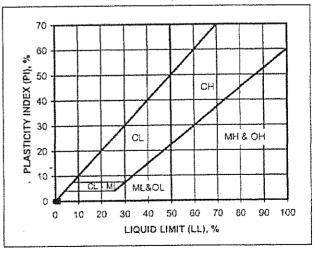
The sampler, with an external diameter of 3.0 inches, was lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with a 140-pound hammer free-falling from a height of 30 inches in general accordance with ASTM D 1586-84. The samples were removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

	U.S.C.S. METHOD OF SOIL CLASSIFICATION							
MA	JOR DIVISIONS	SYMBOL	TYPICAL NAMES					
		GW	Well graded gravels or gravel-sand mixtures little or no fines					
LS	GRAVELS (More than 1/2 of coarse	GP	Poorly graded gravels or gravel-sand mixtures, little or no fines					
COARSE-GRAINED SOILS (More than 1/2 of soil >No. 200 sieve size)	fraction > No. 4 sieve size)	GM	Silty gravels, gravel-sand-silt mixtures					
ARSE-GRAINED SO: (More than 1/2 of soil >No. 200 sieve size)		GC	Clayey gravels, gravel-sand-clay mixtures					
SE-GR ore tha o. 200	SANDS (More than 1/2 of coarse fraction <no. 4="" sieve="" size)<="" td=""><td>SW</td><td>Well graded sands or gravelly sands, little or no fines</td></no.>	SW	Well graded sands or gravelly sands, little or no fines					
OARS (Mc >N		SP	Poorly graded sands or gravelly sands, little or no fines					
C		SM	Silty sands, sand-silt mixtures					
		SC	Clayey sands, sand-clay mixtures					
	untersection (CER PER PER PER PER PER PER PER PER PER P	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity					
SOILS f soil ize)	SILTS & CLAYS Liquid Limit <50	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays					
NED S 1/2 o sieve s		OL	Organic silts and organic silty clays of low plasticity					
FINE-GRAINED SOILS (More than 1/2 of soil <no. 200="" sieve="" size)<="" td=""><td></td><td>МН</td><td>Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts</td></no.>		МН	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts					
FINE- (Mo)	SILTS & CLAYS Liquid Limit >50	СН	Inorganic clays of high plasticity, fat clays					
	•	ОН	Organic clays of medium to high plasticity, organic silty clays, organic silts					
HIGH	LY ORGANIC SOILS	Pt	Peat and other highly organic soils					

## CLASSIFICATION CHART (Unified Soil Classification System)

-	RANGE OF GRAIN SIZES				
CLASSIFICATION	U.S. Standard Sieve Size	Grain Size in Millimeters			
BOULDERS	Above 12"	Above 305			
COBBLES	12" to 3"	305 to 76.2			
GRAVEL Coarse Fine	3" to No.4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76			
SAND Coarse Medium Fine	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.074 4.76 to 2.00 2.00 to 0.420 0.420 to 0.074			
SILT & CLAY	Below No. 200	Below 0.074			

GRAIN SIZE CHART



PLASTICITY CHART



U.S.C.S. METHOD OF SOIL CLASSIFICATION

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•					100	SW	(SW:D) = well graded						
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<b>V</b>		•		₹"		PROJECT NO. SYMSAMP	Rev. 5/99	Legend-3				

DATE DRILLED 7/10/01 BORING NO. CH-1 GROUND ELEVATION 1312 SHEET 1 OF 2 METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger DRIVE WEIGHT 140 lbs. (Auto) DROP 30" SAMPLED BY MDE LOGGED BY MDE REVIEWED BY LLG DESCRIPTION/INTERPRETATION  ALLUVION: Brown (7 5 YR 5/4), damp, loose to dense, clayey SILT. Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  SM Pale brown (10 YR 6/3), dry to damp, dense, silty SAND; trace fine, subrounded gravel. Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  CL Reddish brown (5 YR 5/4), damp, hard, silty CLAY. Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.		LES		_	CF)		Z	DATE DRILLED	7/10/01	BORING NO	CH-1				
DRIVE WEIGHT 140 lbs. (Auto) DROP 30*  SAMPLED BY MDE LOGGED BY MDE REVIEWED BY LLG  DESCRIPTION/INTERPRETATION  ML ALLUVIUM: Brown (7.5 YR 5/4), damp, loose to dense, clayey SILT.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  Medium dense.  SM Pale brown (10 YR 6/3), dry to damp, dense, silry SAND; trace fine, subrounded gravel.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  CL Reddish brown (5 YR 5/4), damp, hard, silry CLAY.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.	eet)	\MP	007	(%) =	۲ (P	7	ATIC S.	GROUND ELEVATIO	N <u>1312'</u>	SHEET	1OF2				
SAMPLED BY MDE LOGGED BY MDE REVIEWED BY LLG DESCRIPTION/INTERPRETATION  ML ALLUVIUM: Brown (7.5 YR 5/4), damp, loose to dense, clayey SILT.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  Medium dense.  SM Pale brown (10 YR 6/3), dry to damp, dense, sity SAND; trace fine, subrounded gravel.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  CL Reddish brown (5 YR 5/4), damp, hard, silty CLAY.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.	TURI NSIT														
DESCRIPTION/INTERPRETATION  ML ALLUYUM: Brown (7.5 YR 5/4), damp, loose to dense, clayey SILT. Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  Medium dense.  SM Pale brown (10 YR 6/3), dry to damp, dense, silty SAND; trace fine, subrounded gravel. Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  CL Reddish brown (5 YR 5/4), damp, hard, silty CLAY. Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.							VSSI U.S	DRIVE WEIGHT	30"						
ML ALLUYIUM: Brown (7.5 YR 5/4), damp, loose to dense, clayey SILT. Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  Medium dense.  SM Pale brown (10 YR 6/3), dry to damp, dense, silty SAND; trace fine, subrounded gravel. Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  CL Reddish brown (5 YR 5/4), damp, hard, silty CLAY. Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.	0	Briv	窗	Ž	ЭЯΥ		CLZ	SAMPLED BY M			D BY LLG				
Brown (7.5 YR 5/4), damp, loose to dense, clayey SILT.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  Medium dense.  SM Pale brown (10 YR 6/3), dry to damp, dense, silty SAND; trace fine, subrounded gravel.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  CL Reddish brown (5 YR 5/4), damp, hard, silty CLAY.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.			,				NAS	ALLIWIIM.	DESCRIPTION/IN	HERPRETATION					
with HCL, sparse calcium carbonate filaments.  Medium dense.  SM Pale brown (10 YR 6/3), dry to damp, dense, silty SAND; trace fine, subrounded gravel. Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  CL Reddish brown (5 YR 5/4), damp, hard, silty CLAY. Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.	0						1415	Brown (7.5 YR 5/4)	-						
Medium dense.    10	-							Stage I cementation, with HCL, sparse ca	weakly cemented by calcium carbonate filame	calcium carbonate, v ents.	veak reaction				
Medium dense.    10	-														
Medium dense.    10	_	**	42								·				
9 10.7 Medium dense.  SM Pale brown (10 YR 6/3), dry to damp, dense, silty SAND; trace fine, subrounded gravel.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  CL Reddish brown (5 YR 5/4), damp, hard, silty CLAY.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.		State of Table	42												
9 10.7 Medium dense.  SM Pale brown (10 YR 6/3), dry to damp, dense, silty SAND; trace fine, subrounded gravel.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  CL Reddish brown (5 YR 5/4), damp, hard, silty CLAY.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.	•			1											
SM Pale brown (10 YR 6/3), dry to damp, dense, silty SAND; trace fine, subrounded gravel.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  CL Reddish brown (5 YR 5/4), damp, hard, silty CLAY.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.	5 -														
Pale brown (10 YR 6/3), dry to damp, dense, silty SAND; trace fine, subrounded gravel.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  CL  Reddish brown (5 YR 5/4), damp, hard, silty CLAY.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.		1	9	10.7				Medium dense.							
Pale brown (10 YR 6/3), dry to damp, dense, silty SAND; trace fine, subrounded gravel.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  CL Reddish brown (5 YR 5/4), damp, hard, silty CLAY.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.	-							·							
Pale brown (10 YR 6/3), dry to damp, dense, silty SAND; trace fine, subrounded gravel.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  CL Reddish brown (5 YR 5/4), damp, hard, silty CLAY.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.	-														
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subrounded gravel.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  CL Reddish brown (5 YR 5/4), damp, hard, silty CLAY.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.		11 11.1 88.4						-		•					
subrounded gravel.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  CL Reddish brown (5 YR 5/4), damp, hard, silty CLAY.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.		A COLUMN													
subrounded gravel.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.  CL Reddish brown (5 YR 5/4), damp, hard, silty CLAY.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.							SM	Pale brown (10 YR	6/3), dry to damp, den	nse, silty SAND; tra	ce fine,				
with HCL, sparse calcium carbonate filaments.  CL Reddish brown (5 YR 5/4), damp, hard, silty CLAY.  Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.	10 -	I							wantly namented by	ralcium carbonate A	veak reaction				
Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.			26	8.9				with HCL, sparse ca	alcium carbonate filam	ents.	weak reaction				
Stage I cementation, weakly cemented by calcium carbonate, weak reaction with HCL, sparse calcium carbonate filaments.															
with HCL, sparse calcium carbonate filaments.				† <del>-</del>			CL	1		•					
			28	10.2	90.1			Stage I cementation with HCL, sparse co	, weakly cemented by calcium carbonate filam	caicium cardonate, v ents.	weak reaction				
		9													
	15 -				_										
16 15.9 Very stiff.			16	15.9	ALIGANA STREET		Very stiff.								
ML Brown (7.5 YR 5/4), damp, loose, clayey SILT.				ļ			NAI -	Brown (7.5 VP 5/4)	) damp loose clavey	SILT.	~~~~~~~~~				
			Q.				144	Stage I cementation, non-cemented, no reaction to HCL.							
	Waynest Annual Control of the Contro		,					Sugar volumentary man demandary no reaction to reaction							
BORING LOG	20 -								R	OBING	0G				
East Maricopa Floodway	110000			n.		&L	AA	nnre	East Maricopa Floodway						
Chandler Heights Detention Basin				J	7	A	A F.		PROJECT NO.	DATE	FIGURE				

DEPTH (feet)	Bulk SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DRIVE WEIGHT	N 1312' NG <u>CME 75, 8" Diai</u> 140 lbs. (Auto DE LOGGED BY	meter Hollow-Stem Aug	2 OF
20		21				SM	ALLUVIUM: (continuous pale brown (10 change from ML to	ued) YR 7/4), dry, med	ium dense, silty SANI	D. Soil type
The second section is a forest party of the second section is a second section is a second second section is a				<u>.</u>			Total Depth = 21.5 Groundwater not en Backfilled on 7/10/0	countered.		
					***************************************					
25 -							,			
30 -										
Accompany of the second accomp			:		***************************************					
The state of the s					and the second s					
35 -				·				· · · · · · · · · · · · · · · · · · ·		
The state of the s									·	
40 -										
		Vi		IO	& J	ΛΛι	ore_		BORING LO  East Maricopa Floodw Chandler Heights Detentio	/av
	7.4	<b>V</b>	J		A	A		PROJECT NO. 600198001	DATE 1/02	FIGURE A-2

feet)	SAMPLES	BLOWS/F00T	IE (%)	DENSITY (PCF)	OL	CLASSIFICATION U.S.C.S.	DATE DRILLED         7/17/01         BORING NO.         CH-2           GROUND ELEVATION 1309'         SHEET 1 OF 2						
DEPTH (feet)	7	WS/F	MOISTURE	ISNE	SYMBOL	SIFIC	METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger  DRIVE WEIGHT 140 lbs. (Auto) DROP 30"						
DEP	Driven	BLO	MOI	DRY DE	S	LAS	SAMPLED BY MDE LOGGED BY MDE REVIEWED BY LLG						
	70			占	777		DESCRIPTION/INTERPRETATION						
0						CL	ALLUVIUM: Brown (7.5 YR 5/4), dry, stiff, silty CLAY; scattered caliche filaments,						
							weakly cemented. Stage I, weak reaction with HCL.						
-	_												
		12	9.8	85.5									
-													
5 -													
		45					Hard.						
VIII.													
			:										
		12	8.0				Very stiff.						
10		37	47	100.8			Hard.						
1		31	4.7	100.8			ridiu.						
	8	2/9"	13.3				Stage I cementation, scattered caliche filaments, weakly cemented, weak						
			2010				to no reaction with HCL.						
-													
15 -						SM	Pale brown (10 YR 6/3), dry, medium dense, silty SAND.						
		39											
-						CL	Brown (7.5 YR 5/4), dry, hard, silty CLAY. Stage II cementation, scattered caliche nodules, moderately cemented.						
		53	5.5				Stage if Commentation, Scattered Camene modules, moderatory commence.						
		J.J	3.3	4 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7									
20 -					V///		BORING LOG						
When There are a second	A		n	IO	81	M	East Maricopa Floodway Chandler Heights Detention Basin PROJECT NO. DATE FIGURE						
				-40505	A	<b>V</b>	PROJECT NO. DATE FIGURE 600198001 1/02 A-3						

DATE DRILLED 7/17/01 BORING NO. CH-2  GROUND ELEVATION 1309' SHEET 2 OF  METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger	2				
CH-22    CH-22					
DROP	······				
DESCRIPTION/INTERPRETATION	<u>LG</u>				
DESCRIPTION/INTERPRETATION  CL ALLUVIUM: (continued)					
Brown (7.5 YR 5/4), dry, hard, silty CLAY. Stage II cementation, scattered calcium carbonate nodules.					
Total Depth = 21.5' Groundwater not encountered.					
Piezometer installed on 7/17/01.					
30 + -					
35					
	····				
BORING LOG					
East Maricopa Floodway					
Changler rieights Detention Basin	RE				

DATE DRILLED	ES			(F)		2	DATE DRILLED 7/11/01 BORING NO. CH-3
DRIVE WEIGHT  SAMPLED BY  DESCRIPTION/INTERPRETATION  CL  FILL: Brown (7.5 YR 5/4), damp, medium dense, sandy SILT. Stage I cementation, scattered calcium dense, sandy SILT. Stage I cementation, weakly cemented, moderage reaction with ECL.  SM  Brown (7.5 YR 5/4), damp, dense to very dense, silty SAND; some the subrounded grave). Stage II cementation, moderate cementation by caliche, color change to light gray.  CL  Brown (7.5 YR 5/4), damp, dense to very dense, silty SAND; some the subrounded grave). Stage II cementation, moderate cementation by caliche, color change to light gray.  CL  Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, moderate cementation by caliche, color change to light gray.  CL  Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.	eet}	T00	E (%	Ч (Р	7	ATIC S.	
SAMPLED BY MDE LOGGED BY MDE REVIEWED BY LLG DESCRIPTION/INTERPRETATION  CL FILL: Brown (7.5 YR 5/4), damp, stiff, sitry CLAY. Stage I cementation, scattered calcium dense, sandy SILT. Stage I cementation, weakly cemented, moderage reaction with HCL.  SM Brown (7.5 YR 5/4), damp, dense to very dense, sitry SAND; some fine subrounded grave!. Stage II cementation, moderate cementation by caliche, color change to light gray.  CL Brown (7.5 YR 5/4), damp, hense to very dense, sitry SAND; some fine subrounded grave!. Stage II cementation, moderate cementation by caliche, color change to light gray.  CL Brown (7.5 YR 5/4), damp, hense to very dense, sitry SAND; some fine subrounded grave!. Stage II cementation, moderate cementation by caliche, color change to light gray.	H H	VS/F	TUR	NSIT	MB	IFIC S.C.	
DESCRIPTION/INTERPRÉTATION  CL FILL: Brown (7.5 YR 5/4), damp, stiff, slity CLAY. Stage II comentation, scattered calcium carbonate filaments, weakly comented.  Very stiff.  ML ALLUVIUM: Reddish brown (5 yr 5/4), damp, medium dense, sandy SILT. Stage I comentation, weakly comented, moderage reaction with HCL.  SM Brown (7.5 YR 5/4), damp, dense to very dense, silty SAND; some fine subrounded gravel. Stage II comentation, moderate comentation by caliche, color change to light gray.  CL Brown (7.5 YR 5/4), damp, hard, slity CLAY. Stage II comentation, trace caliche nodules less than 1/2" in diameter.	SEPT SEPT		OIS	DE	λS	ASS U.	
CL FILL.  Brown (7.5 YR 5/4), damp, stiff, silty CLAY. Stage II cementation, scattered calcium carbonate filaments, weakly cemented.  10  34 8.4  Hard; few sand.  ML ALLUYIUM. Reddish brown (5 yr 5/4), damp, medium dense, sandy SILT. Stage I cementation, weakly cemented, moderage reaction with HCL.  SM Brown (7.5 YR 5/4), damp, dense to very dense, silty SAND; some tine subrounded gravel. Stage II cementation, moderate cementation by caliche, color change to light gray.  CL Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.		5 8	Σ	DRY		Cr.	
Stage II cementation, scattered calcium carbonate filaments, weakly cemented.  12 14.5 84.2  Nery stiff.  Wery stiff.  ML ALLUVIUM: Reddish brown (5 yr 5/4), damp, medium dense, sandy SILT. Stage I cementation, weakly cemented, moderage reaction with HCL.  SM Brown (7.5 YR 5/4), damp, dense to very dense, silty SAND; some fine subrounded gravel. Stage II cementation, moderate cementation by caliche, color change to light gray.  CL Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.	0					CL	FILL:
Very stiff.  NL  ALLUVIUM: Reddish brown (5 yr 5/4), damp, medium dense, sandy SILT. Stage I cementation, weakly cemented, moderage reaction with HCL.  SM  Brown (7.5 YR 5/4), damp, dense to very dense, silty SAND; some fine subrounded gravel. Stage II cementation, moderate cementation by caliche, color change to light gray.  CL  Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.							Stage II cementation, scattered calcium carbonate filaments, weakly
Very stiff.  No. 10							
Very stiff.    10		12	14.6	84.2			
Very stiff.    10							
Very stiff.    10	- L						
Hard; few sand.  ML ALLUYIUM: Reddish brown (5 yr 5/4), damp, medium dense, sandy SILT. Stage I cementation, weakly cemented, moderage reaction with HCL.  SM Brown (7.5 YR 5/4), damp, dense to very dense, silry SAND; some fine subrounded gravel. Stage II cementation, moderate cementation by caliche, color change to light gray.  CL Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.		17					Very stiff
ML ALLUVIUM: Reddish brown (5 yr 5/4), damp, medium dense, sandy SILT. Stage I cementation, weakly cemented, moderage reaction with HCL.  SM Brown (7.5 YR 5/4), damp, dense to very dense, silty SAND; some fine subrounded gravel. Stage II cementation, moderate cementation by caliche, color change to light gray.  CL Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.		17					Voly Siii.
ML ALLUVIUM: Reddish brown (5 yr 5/4), damp, medium dense, sandy SILT. Stage I cementation, weakly cemented, moderage reaction with HCL.  SM Brown (7.5 YR 5/4), damp, dense to very dense, silty SAND; some fine subrounded gravel. Stage II cementation, moderate cementation by caliche, color change to light gray.  CL Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.				1			
ML ALLUVIUM: Reddish brown (5 yr 5/4), damp, medium dense, sandy SILT. Stage I cementation, weakly cemented, moderage reaction with HCL.  SM Brown (7.5 YR 5/4), damp, dense to very dense, silty SAND; some fine subrounded gravel. Stage II cementation, moderate cementation by caliche, color change to light gray.  CL Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.							
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Reddish brown (5 yr 5/4), damp, medium dense, sandy SILT. Stage I cementation, weakly cemented, moderage reaction with HCL.  SM  Brown (7.5 YR 5/4), damp, dense to very dense, silty SAND; some fine subrounded gravel. Stage II cementation, moderate cementation by caliche, color change to light gray.  CL  Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.		_		-			
Stage I cementation, weakly cemented, moderage reaction with HCL.  SM Brown (7.5 YR 5/4), damp, dense to very dense, silty SAND; some fine subrounded gravel. Stage II cementation, moderate cementation by caliche, color change to light gray.  CL Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.	10					ML	ALLUVIUM:
SM Brown (7.5 YR 5/4), damp, dense to very dense, silty SAND; some fine subrounded gravel. Stage II cementation, moderate cementation by caliche, color change to light gray.  CL Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.	10			100 1			Stage I cementation, weakly cemented, moderage reaction with HCL.
subrounded gravel. Stage II cementation, moderate cementation by caliche, color change to light gray.  67/11" 6.3  CL Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.		35	5.4	102.1			
subrounded gravel. Stage II cementation, moderate cementation by caliche, color change to light gray.  67/11" 6.3  CL Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.			ļ				The second secon
light gray.  67/11" 6.3  CL Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.						SM	subrounded gravel.
67/11" 6.3  CL Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.		55	3.0				Stage II cementation, moderate cementation by caliche, color change to light gray.
67/11" 6.3  CL Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.							
67/11" 6.3  CL Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.							
Stage II cementation, trace caliche nodules less than 1/2" in diameter.	15	67/11"	6.3				
Stage II cementation, trace caliche nodules less than 1/2" in diameter.	-						
Stage II cementation, trace caliche nodules less than 1/2" in diameter.							
						CL	Brown (7.5 YR 5/4), damp, hard, silty CLAY. Stage II cementation, trace caliche nodules less than 1/2" in diameter.
		68	7.4	95.8			
11.00							
BORING LOG	20 -1-1						BORING LOG
East Maricopa Floodway Chandler Heights Detention Basin PROJECT NO DATE FIGURE		A Iñ			<b>&amp;</b>	ΛΛ	East Maricopa Floodway
			D		A	A B	PROJECT NO. DATE FIGURE 600198001 1/02 A-5

	LES	_	(	E		<u> </u>	DATE DRILLED	7/11/01	BORING NO.	(	CH-3		
DEPTH (feet)	SAMPLES	BLOWS/FOOT	MOISTURE (%)	DENSITY (PCF)	<u>ا</u>	CLASSIFICATION U.S.C.S.		N <u>1309'</u>			OF	2	
E	+-1	VS/F	TUR	NSI	SYMBOL	S.C.		NG CME 75, 8" Diame					
OEP-	Bulk Driven	3L.0V	1018	, DE	S)	ASS. U.	ASS. U.		140 lbs. (Auto)				
	<u>a</u>	m	2	DRY		ರ	SAMPLED BY M	DE LOGGED BY DESCRIPTION/IN		D BY _	LLG		
20						ML	ALLUVIUM: (contin						
		70	7.1				Stage II cementation	, damp, hard, sity CL, trace carbonate nodu	les less than 1/2" in	diamete	r.		
							Total Depth = 21.5 Groundwater not en	1		<del></del>			
	$\prod$						Groundwater not end Backfilled on 7/11/0	countered. )1.		•			
	$\vdash$												
								·					
25 -													
	+												
30 -													
	-												
0.5												•	
35													
A SAME TO SECURE													
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	+-			No. of the Control of									
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40			L,				][		ODINIO I	70			
					بو	AA	nnre	BORING LOG  East Maricopa Floodway					
		V	15	<i>y</i> <b>U</b>		A	oore_	Cha PROJECT NO.	ndler Heights Detention	n Basin	FIGURE		
		7						600198001	1/02		A-6		

(feet) SAMPLES	OT	(%)	DENSITY (PCF)		CLASSIFICATION U.S.C.S.	DATE DRILLED	7/11/01 DN 1308'	BORING NO	CH-4 1 OF 2		
DEPTH (feet)	BLOWS/FOOT		SITY	SYMBOL	ICA <sup>-</sup> C.S.		ING CME 75, 8" Diame				
	OWS	MOISTURE	ENS	SYN	SSIF U.S.		140 lbs. (Auto)		30"		
DEP Bulk	B	Σ	DRY [		CLA	SAMPLED BYM	IDE LOGGED BY	MDE REVIEWE	D BY LLG		
			口	7777			DESCRIPTION/IN	ITERPRETATION			
0			·		CL	ALLUVIUM: Brown (7.5 Yr 5/4) Stage I cementation	, damp, very stiff, silty, scattered calcium carb	CLAY. conate filaments.			
1.00											
	14										
	14								T MEMORY OF THE PROPERTY OF TH		
5											
	13	6.0				Thin layer of silty t	fine sand.				
									2000		
	35	13.0	72.5			Hard, scattered calc	cium carbonate filament	:S.			
									-		
									^		
10											
	12	7.7				Very stiff.	·				
		-									
	90/11"	6.3	93.8			Hard.					
		ļ			ML		0 YR 7/4), dry to damp	p, dense, clayey SIL	T; few fine		
15						gravel, trace coarse Stage II cementatio	e gravel. n below 15 feet modera	ite reaction with HC	L.		
	21	3.1									
	<b></b>					T	10D 0/1	anna danaa Maran M	NYD		
	8				SP-SM	Stage II cementatio	10B 8/1), dry to damp, n, grains coated by calculate HCL on coatings	very dense, silty SA cium carbonate, mat	rix loose,		
	82/11"	2.3	117.0			moderate reaction v	with HCL on coatings.				
20											
			***************************************			Attended to the second of the	В	ORING L	OG		
			10	&	M	oore_	East Maricopa Floodway Chandler Heights Detention Basin				
			7	.#S		1	PROJECT NO. 600198001	DATE 1/02	FIGURE A-7		

DATE DRILLED 7/11/01 BORING NO. CH-4  GROUND ELEVATION 1308' SHEET 2 OF 2  METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger  DRIVE WEIGHT 140 lbs. (Auto) DROP 30"  SAMPLED BY MDE LOGGED BY MDE REVIEWED BY LLG  DESCRIPTION/INTERPRETATION  20  30  Total Depth = 21.5' Groundwater not encountered. Backfilled on 7/11/01.						
DRIVE WEIGHT 140 lbs. (Auto) DROP 30"  SAMPLED BY MDE LOGGED BY MDE REVIEWED BY LLG  DESCRIPTION/INTERPRETATION  SM ALLUVIUM: (continued)     Light bluish gray (10B 8/1), dry, dense, silty SAND.  Total Depth = 21.5' Groundwater not encountered. Backfilled on 7/11/01.						
30  SM ALLUVIUM: (continued) Light bluish gray (10B 8/1), dry, dense, silty SAND.  Total Depth = 21.5' Groundwater not encountered. Backfilled on 7/11/01.						
30  SM ALLUVIUM: (continued) Light bluish gray (10B 8/1), dry, dense, silty SAND.  Total Depth = 21.5' Groundwater not encountered. Backfilled on 7/11/01.						
30  SM  ALLUVIUM: (continued) Light bluish gray (10B 8/1), dry, dense, silty SAND.  Total Depth = 21.5' Groundwater not encountered. Backfilled on 7/11/01.						
Light bluish gray (10B 8/1), dry, dense, silty SAND.  Total Depth = 21.5' Groundwater not encountered. Backfilled on 7/11/01.						
Total Depth = 21.5' Groundwater not encountered. Backfilled on 7/11/01.						
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40 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						
ROBING LOG						
East Maricopa Floodway Chandler Heights Detention Basin  PROJECT NO DATE FIGURE	East Maricopa Floodway					
PROJECT NO. DATE FIGURE 600198001 1/02 A-8						

エー	Driven SAMPLES BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	GROUND ELEVATION METHOD OF DRILLI DRIVE WEIGHT	7/11/01  N 1307  NG CME 75, 8" Diam  140 lbs. (Auto  DE LOGGED BY  DESCRIPTION/I	SHEET neter Hollow-Stem Aug ) DROP	1 OF 2 ger 30"
0	15	7.0	90.3		CL <sub>1</sub>	ALLUVIUM: Brown (7.5 YR 5/4) Stage I cementation,	, damp, very stiff, sil scattered calcium car	ty CLAY. bonate filaments.	
5	14	12.8			ML	Pale brown (10 YR	6/3), dry, dense to ve	ery dense, clayey SIL	.T.
10 —	83	7.4				ouge I comentation,			
15 —	33	5.3							
	43	3.9			CL	Reddish brown (5 Y CLAY; some mediu	R 5/4) to pale brown m to fine sand.	(10 YR 6/3), damp,	hard, silty
20 —		ng	10	<b>8</b>	<b>M</b>	ore_		ORING L  East Maricopa Floodwandler Heights Detention  DATE 1/02	vav

DEPTH (feet)	Bulk Driven SAMPLES	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	METHOD OF DRILLI DRIVE WEIGHT	7/11/01  DN 1307'  ING CME 75, 8" Diame  140 lbs. (Auto)  DE LOGGED BY _  DESCRIPTION/IN	ter Hollow-Stem Aug DROP MDE REVIEWE				
20		54	4.6	96.1		CL	Stage I cementation	6/3), damp to dry, hare, scattered calcium carb	d, silty CLAY.				
25 -							Total Depth = 21.5 Groundwater not en Backfilled on 7/11/0	countered.					
30 -													
35 -													
77		V/i	n L	10	EL I	ΛΛ	ore_	BORING LOG  East Maricopa Floodway Chandler Heights Detention Basin					
		<b>V</b>			<i>/</i>			PROJECT NO. 600198001	DATE 1/02	FIGURE A-10			

DEPTH (feet)	SAMPLES	BLOWS/FOOT	MOISTURE (%)	DENSITY (PCF)	SYMBOL	ASSIFICATION U.S.C.S.	DATE DRILLED  GROUND ELEVATION  METHOD OF DRILLIN  DRIVE WEIGHT	N <u>1308'</u> NG <u>CME 75, 8" Diam</u>	SHEET neter Hollow-Stem Aug	1OF2
DEF	Bulk Driven	BLO	MOI	DRY DI	S	CLAS	SAMPLED BY MI	DE LOGGED BY		
0		Week and the second second and the second second and the second second second and the second				CL	ALLUVIUM: Brown (7.5 YR 5/4), Stage I cementation, cemented.	dry, very stiff, silty	CLAY.	to weakly
-		22								
5 -		13	6.6			ML	Brown (7.5 YR 5/4), scattered caliche strir Stage I cementation, cemented.	ngers.		
		29	4.9	96.1						
10 -		41	4.2					·		
-		24				SM	Brown (7.5 YR 5/4) dense, silty SAND; f Stage I cementation, cemented, weak to no	ew fine gravel. trace calcium carbon	ate filaments, non -te	
15 -			Antitation of the state of the							
		11	0.6							
		34	1.8	121.5			Stage II cementation carbonate on fine gra			calcium
20 -			<u> </u>					B	ORING L	OG
				10	84	M	aroc		East Maricopa Floodwandler Heights Detentio	/ay
				•	,,,,,	<b>7</b>		PROJECT NO. 600198001	DATE 1/02	FIGURE A-11

	SAMPLES			E		Z	DATE DRILLED		7/17/01	BORIN	G NO	i	CH-6	
et)	MP	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	_	CLASSIFICATION U.S.C.S.	GROUND ELEVATION	ON <u>130</u>	)8'		SHEET _	22	_ OF	2
DEPTH (feet)		S/F(	L R	SIT	SYMBOL	5F.O.	METHOD OF DRILL	ING C	ME 75, 8" Diame	ter Hollow	-Stem Auger		<del></del>	
H di	2 Su	ΜO	TSI	OEN	SYN	SSII U.S	DRIVE WEIGHT		140 lbs. (Auto)		_ DROP _		30"	
ä	Bulk Driven	В	Σ	RY		CLA	SAMPLED BY N	IDE	LOGGED BY	MDE	REVIEWED	BY	LLG	
				Ω	14444454				SCRIPTION/IN	TERPRE	TATION			
20		<b>6</b> 2	1.6	107.1		SM	ALLUVIUM: (conti Pale brown (10 YR	nued) 6/3), c	lry to damp, den	se, silty S	SAND; few f	ine		
		63	1.6	127.1			gravel. Stage II cementation	n.						
					E		Total Depth = 21.5 Groundwater not er		•					
							Piezometer installed	ncounte d on 7/	red. 17/01.					
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	Æ	. #9	) 		_						<u>IG LO</u>	<u>G</u>		
and the same		VIII	14	IO.	St /		ore_	1	Char	idler Heigh	opa Floodway its Detention B	asin		
	<i></i>	<b>V</b>				₹'			OJECT NO. 600198001	DA1 1/0			FIGURE A-12	

TH (feet)	SAMPLES	BLOWS/FOOT	MOISTURE (%)	DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED 7/11/01 BORING NO. CH-7  GROUND ELEVATION 1306' SHEET 1 OF 2  METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger
DEPTH	Bulk Driven	BLO\	MOIS	DRY DE	S	CLASS	DRIVE WEIGHT 140 lbs. (Auto) DROP 30"  SAMPLED BY MDE LOGGED BY MDE REVIEWED BY LLG  DESCRIPTION/INTERPRETATION
0						ML	ALLUVIUM: Brown (7.5 YR 5/4), damp, medium dense, clayey SILT. Stage I cementation, weakly cemented by scattered calcium carbonate filaments.
	E	21	6.9	92.7			
5		24	5.9	96.8		CL	Brown (7.5 YR 5/4), damp, very stiff, silty CLAY; some fine sand. Stage I cementation, weakly cemented by scattered calcium carbonate filaments.
		51	5.6				Hard.
10 -		62	5.3	99.8			
		15	1.8			SM	Pale brown (5 YR 6/2), dry to damp, medium dense, silty SAND; scattered fine gravel.
15 -		74 .	1.0	129.6	EII	SP	Pale brown, dry to damp, very dense, SAND with fine to coarse gravel.  Stage II cementation below 15 feet; weak to moderate reaction with HCL.
5		51	1.2				
20 -		\			es e	ΛΛι	BORING LOG  East Maricopa Floodway Chandler Heights Detention Basin

PROJECT NO. 600198001 DATE 1/02 FIGURE A-13

	LES			(CF.)		Z	DATE DRILLED 7/11/01	BORIN	IG NO	CH-7	
eet)	SAMPLES	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	7	CLASSIFICATION U.S.C.S.	GROUND ELEVATION 1306'		SHEET	2 OF	2
H (f	1 1	/S/F	U.B.	ISIT	SYMBOL		METHOD OF DRILLING CME 75, 8" I	Diameter Hollov	w-Stem Auger		
DEPTH (feet)	k en	. VO	LSIC	DEN	SΥ	SSI U.S	DRIVE WEIGHT 140 lbs. (A				
Ω	Bulk Driven	B	ž	ЯУ		CLA	SAMPLED BY MDE LOGGED			BY <u>LLG</u>	*****
20				[]	UUIH	GM	DESCRIPTION ALLUVIUM: (continued)	ON/INTERPRE	TATION		
-		66				GM	Pale brown (10 YR 6/3), dry, dense, Stage II cementation, thin calcium carweak to no reaction with HCL.	silty GRAVE)	L. g, matrix loose	<b>,</b>	
					2124		Total Depth = 21.5' Groundwater not encountered.				
							Backfilled on 7/11/01.				
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25 -	- -										
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40 -			<u></u>				- The second sec				
	A								<u>VG LO</u>		
	_/	V/L	714	<b>JO</b>	84	W	DOLECTIVO		copa Floodway hts Detention Ba		
	<i>a 20</i> 2				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	<b>V</b>	PROJECT NO. 600198001		TE 02	FIGURE A-14	

	LES			Œ		Z	DATE DRILLED	7/11/01		BORING	NO		СН-8
(feet)	SAMPLES	BLOWS/FOOT	(%)	DENSITY (PCF)	7	CLASSIFICATION U.S.C.S.	GROUND ELEVATION	ON <u>1306'</u>			SHEET	1	OF2
± H	/S	S/F	MOISTURE	TISI	SYMBOL	등 (2)	METHOD OF DRILL	ING <u>CME 75, 8</u>	" Diamet	er Hollow-	Stem Auge	r	
DEPTH	en en	Š,	ISIC		SΥ	SSI U.S	DRIVE WEIGHT	140 lbs.	(Auto)	<u>.                                    </u>	DROP		30"
Ω	Bulk Driven	函	Ž	DRY		CLA	SAMPLED BY N		_			D BY	LLG
0			<u> </u>	<u></u>	77	CL	ALLUVIUM:	DESCRIPT	ION/IN	EKPKE	ATION		
-		22	6.0	91.8			Brown (7.5 YR 5/4 Stage I cementation moderate reaction v	i, sparse calcium	tiff, silty a carbona	CLAY. ate filamen	nts, weakly	/ cemer	nted,
5 -		6	THE REAL PROPERTY AND ADDRESS OF THE PARTY AND				Stiff.						
		9	2.8			SM	Pale brown (10 YR gravel.  Stage I cementation weak reaction with	ı, no calcium car	rbonate c				ace fine
10 -		24	2.8	105.1									
		12					Loose.						
15 -		20	3.6				Medium dense to d	ense.					
		52	2.8	117.5		SM/GM	Light yellowish bro fine gravel; increas Stage II cementatio	e in gravel conte	ent.				with
20 -									R	JBIVI	G LC	)G	
				ın	<b>&amp;</b> 2	ΛΛι	ore_			East Marico	pa Floodwa	y	
			J	7			The second section of the sect	PROJECT N	o.	dler Heigh DAT 1/0		Basin	FIGURE A-15
II								600198001		1/0.	4		W-13

DEPTH (feet)  Bulk SAMPLES	S	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	GROUND ELEVATION METHOD OF DRILLI DRIVE WEIGHT	7/11/01  DN 1306'  ING CME 75, 8" Diame  140 lbs. (Auto)  IDE LOGGED BY  DESCRIPTION/IN	SHEET eter Hollow-Stem Aug DROP	2 OF2 er 30"
20	27	3.9			SM/GM	ALLUVIUM: (continuing Light yellowish broggravel. Stage II cementation Total Depth = 21.5 Groundwater not en Backfilled on 7/11/0	nued) own (10 YR 6/4), dry to  n.  countered.		SAND with
30									
35									
40	Vii	ng	10	& & A	M	ore_		ORING LO East Maricopa Floodwandler Heights Detention DATE 1/02	ay

ᅵ파	Driven SAMPLES	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DRIVE WEIGHT		DROP  MDE REVIEWE	1OF2
0		13				SM	ALLUVIUM: Pale brown (10 YR Stage I cementation.	6/3), dry, loose, silty S	AND; few fine grav	vel.
5 -		31				ML	Pale brown (10 YR clayey SILT.	6/3) to brown (7.5 YR	5/4), dry to damp,	medium dense,
10		11	9.3			SM	Pale brown (10 YR silty SAND; few fir	6/3) to brown (10 YR 3 ne gravel.	5/3), dry to damp, r	nedium dense,
10		30	1.7	107.4						
15 —		32	1.5				Dense.			
1.3	3	56					Few fine gravel; tra Stage II cementation on gravel grains, ma	a below 15 feet, continu	nous calcium carbon	nate coatings
20		21	0.7							
	A			'IN	æ.	ΛΛ	oore_		ORING LO East Maricopa Floodw	ay .
			D		A	AF		PROJECT NO. 600198001	ndler Heights Detention DATE 1/02	n Basin FIGURE A-17

(1)	SAMPLES	L	(%)	DENSITY (PCF)		<u>S</u>		7/17/01				
DEPTH (feet)	SAN	BLOWS/FOOT	JRE (	SITY	SYMBOL	CLASSIFICATION U.S.C.S.		ON <u>1306'</u> LING <u>CME 75, 8" Diam</u> e		OF ger		
PTH	J	SMC	MOISTURE	ENS	SYM	SSIF U.S.	1	140 lbs. (Auto)				
DE	Bulk Driven	B	MO	DRY [		CLA	SAMPLED BYN	MDE LOGGED BY		ED BYLLG		
					RRERE			DESCRIPTION/IN	TERPRETATION			
20		46	12.0	108.2		sc	Stage II cementation	6/3), damp, dense, cla n.	yey SAND.			
A COLUMN TO THE PARTY OF THE PA							Total Depth = 21.: Groundwater not er Piezometer installed	5' ncountered. d on 7/17/01.				
25 -												
The second of th												
30 -	-											
			THE PROPERTY AND ADDRESS OF THE PROPERTY ADDRESS OF THE PROPER									
The second secon										*		
			WALLEST TRANSPORTED TO THE TAXABLE PROPERTY OF TAXABLE PRO									
35			The state of the s									
The state of the s			TO THE TAXABLE PROPERTY OF TAXABLE	The state of the s								
40 -			The state of the s									
			<u> </u>					BORING LOG				
	_/	VII	74	<b>JO</b>	EL		oore_	Cha	East Maricopa Floody ndler Heights Detentio	on Basin		
	odi <b>(200</b>	▼				₩		PROJECT NO. 600198001	DATE 1/02	FIGURE A-18		

	ES			Œ		2	DATE DRILLED	7/11/01	BORING NO.	CH-10	)
eet)	SAMPLES	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	2	CLASSIFICATIÔN U.S.C.S.	GROUND ELEVATION	ON 1306'	SHEET	1 OF	2
E H	SA	S/F(	URE	ISIT	SYMBOL	75.5. 25.5.	METHOD OF DRILL	ING CME 75, 8" Dian	neter Hollow-Stem Aug	er	
DEPTH (feet)	en R	ΜO	TSIC	DEN	SYI	SSI U.S	DRIVE WEIGHT	140 lbs. (Auto	DROP	30	17
0	Bulk Driven	BI	ž	ЯУ		CLA	SAMPLED BY M		MDE REVIEWE	D BY	<u>LLG</u>
0	++-			<u></u>	777	CL	ALLUVIUM:	DESCRIPTION/I	NTERPRETATION		
						OL.	Brown (7.5 YR 5/4)	), dry to damp, hard,	silty CLAY. aments, weakly cemen	ited	
							Stage if Cententation	i, scattered carione in	aments, weakly center	ned.	
	1										
	*									•	
		72/11"					-		•		
5 -											
	$oldsymbol{oldsymbol{I}}$	40									
	1-						Vertice of the control of the contro				
		83/11"					La dalla managara de la dalla				
	+-						A CONTRACTOR OF THE CONTRACTOR			4	
10 -											
10 -											
	+I	25	5.8								
						٠					
				00.0			-				
		50/4"	7.4	92.0				·			
			† <b>-</b>			SM	Pale brown (10 YR	6/3), dry to damp, von below 14.5 feet; mo	ery dense, silty SANI	).	
15 -							Stage II Cementation	i Delow 14.5 feet; IIIC	deratery committee.		
		72	13.2								•
				American Philippins							
			ļ				Th_1_ 1 /4 0 T7T	(10) A 4- 3	om, dones, olerani CA	·	
						SC			ery dense, clayey SAI	NIJ.	
		71	11.3	105.9				er. n, continuous calcium	n carbonate coatings o	n gravel	
***************************************							grains.				
20 -		<u> </u>	<u></u>		ereii			5990	ODINIO	20	
		- <i>1</i> 2			٠.	A A			BORING LO		
	_/		774	JU		VI	oore_		East Maricopa Floodw handler Heights Detention		155
		•				₹'		PROJECT NO. 600198001	DATE 1/02	FIGU A-	

et	SAMPLES	OT	(%)	DENSITY (PCF)		CLASSIFICATION U.S.C.S.	DATE DRILLED			BORING NO	CH-10 2 OF 2	
DEPTH (feet)	SAI	BLOWS/FOOT	MOISTURE	SITY	SYMBOL	FICA .C.S	METHOD OF DRILLI					
EPTI	모	MO	JIST	DEN	SYN	SSII U.S	DRIVE WEIGHT	140 lbs	. (Auto)	DROP	30"	
Ω	Bulk Driven	쩞	Ž	DRY		CLA	SAMPLED BY M				D BY LLG	_
20					HIII	SM	Pale brown (10 YR			TERPRETATION	ND: scattered	
20		24	3.3			JIVI	fine gravel.  Stage II cementation				aris, southered	
100 mm m m m m m m m m m m m m m m m m m							Total Depth = 21.5 Groundwater not en Backfilled on 7/11/0	countered.		,		
-												
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Construction of the Constr												
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	À				دی	AA		BORING LOG  East Maricopa Floodway				
Proceed Process	_/	<b>Y</b>	49	<b>JU</b>	OI.	N	oore_	PROJECT N	Char	DATE	n Basin FIGURE	
		₹				•		60019800		1/02	A-20	

	ES			E		7	DATE DRILLED		7/13/01	BORING	NO.	C	H-11	
et	SAMPLES	10	(%)	DENSITY (PCF)		CLASSIFICATION U.S.C.S.	GROUND ELEVATION							1
(fe	SAI	,/F0	JRE	) ITY	BOI	ICA C.S	METHOD OF DRILL							
DEPTH (feet)	-	BLOWS/FOOT	MOISTURE	ENS	SYMBOL	SSIF J.S.	DRIVE WEIGHT	_		-			30"	
	Bulk Driven	BLC	MON		(V)	LAS	SAMPLED BY M				_	D BY		
			<del>-</del>	DRY		ပ			ESCRIPTION/IN					
0						CL	ALLUVIUM:	45 1	.:	1 -11- (7)	4.77			
_							Brown (7.5 YR 5/4 Stage I cementation	<ol> <li>scatte</li> </ol>	ered caliche filan	nents, weal	kly cement	ed by		
	i i						calcium carbonate,	moder	ate reaction with	HCL.				
-									•					
***************************************														
*		24	6.2	101.1										
-													٠	
5 -														
		57					Hard.							
-														
								-						
		23	11.1											
ATT IN THE REAL PROPERTY OF THE PERSON OF TH														
10 -														
Arrest Manager Arr		32	16.7	104.4			Few sand.							
						SW-SM	Very pale brown (1	in VP	7/A) dry medin	ım dense S	AND with	cilto fex	 X7	
A CONTRACTOR OF THE CONTRACTOR						344-3141	fine gravel.		774), dry, media	im donse, c	72 ET (12) W TEL	i biit, ic	**	
		15	0.3				Stage II cementatio	n.						
15 -														
A		4												
		32	4.4	110.7										
						····	Total Depth = 17.	חי			<del></del>			
The state of the s							Groundwater not en	ncount	ered.					
	$\prod$						Backfilled on 7/13/	/01.			:			
20 -				<u> </u>				7						
	A				- سر	A A			В	ORIN				·····
	_/\	VII	774	<b>JU</b>	St.	M	ore_	<b>!</b>		andler Heigh		Basin		
	. P. S.	▼		•		₩			OJECT NO. 600198001	DA7 1/0			FIGURE A-21	

31)	SAMPLES	10	(%)	(PCF)		CLASSIFICATION U.S.C.S.	DATE DRILLED		BORING	NO	73 Alamana	1
DEPTH (feet)	SAI	BLOWS/FOOT		DENSITY	SYMBOL	ica.	METHOD OF DRILLING		er Hollow-S			1
-PTF	7 %	9W0	MOISTURE	DEN	SYN	SSIF U.S.	DRIVE WEIGHT	140 lbs. (Auto)		DROP	30"	
E E	Bulk Driven	В	MO	DRY [		CLA	SAMPLED BY MDE	<del></del>			BY LLG	
				Ω	777		1 T T T T T T T T T T T T T T T T T T T	DESCRIPTION/IN	TERPRETA	ATION		
5		16	2.2			CL	ALLUVIUM: Light brown (7.5 YR 6 Stage I cementation, we	/4), dry, very stiff, seakly cemented by ca	silty CLAY	7. oonate.		
											~~~~~~~~~~	
10 -		31	3.4	111.1		SM	Light brown (7.5 YR 6 medium dense, silty SA Stage II cementation.	/4) to reddish brown	1 (5 YR 5/4 I.	4), dry, dens	se to	To the state of th
		19	0.8	Market and the second s								
, and		50/5""		AND THE PROPERTY OF THE PROPER								
15 -								•				
-	is in	67/11"	3.8									
				A THE THE PARTY OF			Total Depth = 16.5' Groundwater not encou Backfilled on 7/13/01.	untered.				
20 -	4-1-1		J			***************************************		R	)RIN	G LO	<u> </u>	
		Vii			& 1	AA	eroc	]	East Maricon	a Floodway Detention Ba		
tallon melica			J		A	A P.		PROJECT NO. 600198001	DATE 1/02	E	FIGURE A-22	

	SAMPLES		(%)	(E)		N O	DATE DRILLED			
DEPTH (feet)	AME	BLOWS/F001	₹ (%	DENSITY (PCF)	7	CLASSIFICATION U.S.C.S.	GROUND ELEVATION			1OF1
E	T-  '	NS/	MOĮSTURE	.ISN	SYMBOL	SIFIC S.C.	METHOD OF DRILLIN			
DEP.	riven	Š	SÌOI	, DE	S	ASS U.	DRIVE WEIGHT			
a a	مَّاتِ	1.1.1	2	DRY		づ	SAMPLED BY MD		MDE REVIEW NTERPRETATION	
0						CL	ALLUVIUM:			
-						-	Brown (7.5 YR 5/4) : CLAY.	·		
							Stage I cementation, carbonate filaments.	non-cemented to wea	akly cemented, few c	calcium
-										•
		22	7.0	86.8				•		
5						ML	Brown (7.5 YR 5/4),	damp, loose to med	ium dense, clayey S	ILT.
		14	<b>5</b> 0	71.0						
+		14	5.0	/1.0						
								~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		************************
		•				CL	Brown (7.5 YR 5/4) CLAY.	to light brown (7.5	YR 6/4), damp, very	stiff, silty
-		16								
		•								
		-								
10										
		17	6.2	87.1						
	N									
	<b></b> -					ML	Light brown (7.5 YR	6/4), dry, dense, cl	avev SILT: few sand	d.
							Stage II cementation,	scattered calcium ca	arbonate filaments, c	continuous
-		43					Stage II cementation,	few sand		
-							brage is commentation,	iow state.		
1.5										******
15 -						SM	Light brown (7.5 YR	6/4), damp, mediu	m dense, silty SANI	).
+	-	40	5.0				- Commission of the Commission			
		,,,,,,			Efficie		Total Depth = 16.5'			
							Groundwater not enc Backfilled on 7/13/0	ountered. 1.		
	$\blacksquare$									
				Mil. 4 Total Control of the Control			* Parameter and the second sec			
1									•	
20										
	, gages	<b>9</b> س	)			<b>A</b>		В	ORING L	
	Λ		MU	IO	St.	M	oore_	Ch	East Maricopa Flood andler Heights Detention	way on Basin
		•		,	<i>jak</i>	<b>V</b>		PROJECT NO. 600198001	DATE 1/02	FIGURE A-23

S	3			CF)		Z	DATE DRILLED _		7/13/01	BORIN	G NO	CH-14
(feet)	SAIMPLES	100	(%)	DENSITY (PCF)	_	CLASSIFICATION U.S.C.S.	GROUND ELEVAT	TON <u>13</u>	10'		SHEET _	1 OF 1
H (f	30	BLOWS/F001	MOISTURE	SIT	SYMBOL	FIC/	METHOD OF DRIL	LING C	ME 75, 8" Diame	eter Hollov	v-Stem Auger	<u>r</u>
DEPTH	Le	}	TSIC	DEN	SXI	issi U.s	DRIVE WEIGHT		140 lbs. (Auto)		_ DROP	30"
	Oriven	뮵	Σ	DRY		CLA	SAMPLED BY					D BY LLG
					7777			D	ESCRIPTION/IN	JTERPRE	TATION	
0						CL	ALLUVIUM: Light brown (7.5 Stage I cementation by calcium carbon	on, trace	calcium carbona	ite filamei	silty CLAY nts, weakly (	cemented
	All hands of the state of the s	15	9.0									
5 —												
		9	5.4				Stiff.					
-		47					Hard; scattered ca	aliche fil	aments.			
	ř.	T,					21020, 5500,000					
10								*				
		47	3.9	MANAGEMENT OF THE PROPERTY OF								
		31	5.2				Few sand.					
15		31	1.3	105.3		SW-SM	Light brown (7.5 dense, SAND wi Stage II cementat grains.	th silt ar	id sand: few gray	el. trace	cobbles.	
		27	Transfer to the state of the st				Shoe plugged by	cobble.				
20 -							Total Depth = 1 Groundwater not Backfilled on 7/1	encoun	tered.		, , , , , , , , , , , , , , , , , , , ,	
20 -									В	ORII	VG LC	)G
	A			<i>IO</i>	EL.	$\Lambda\Lambda$ 1	oore_		······	East Mari	icopa Floodwa thts Detention	Υ
			J		A			Pi	ROJECT NO. 600198001	D	ATE /02	FIGURE A-24

	ES		E G		Z	DATE DRILLED	7/13/01	BORING NO	CH-15
eet)	SAMPLES /FOOT	%)	(P)		OT.	GROUND ELEVATION	ON <u>1313'</u>	SHEET	1OF2_
1 (fe	SA S/FC	URE	SIT	/BO	7.5 S.S.	METHOD OF DRILL	ING <u>CME 75, 8" Di</u> a	meter Hollow-Stem Aug	ger
DEPTH (feet)	iven SAMPI BLOWS/FOOT	MOISTURE (%)	OEN	SYMBOL	ASSIFICATION U.S.C.S.	DRIVE WEIGHT	140 lbs. (Au	to) DROP	30"
DE	Driven BLOW	M	DRY DENSITY (PCF)		CLA	SAMPLED BYN	1DE LOGGED BY	MDE REVIEW	ED BY LLG
				777			DESCRIPTION	/INTERPRETATION	
0					CL	ALLUVIUM: Brown (7.5 YR 5/4 Stage I cementation in diameter, weakly	i, scattered calcium c	to very stiff, silty CLz arbonate nodules less t	<b>A</b> Y. han 1/4"
5	22	5.5	82.4						
	13	3.3							
	35		Andreas and a second se			Hard.			
10	76/9	5.7							
15	63					Stage II cementation YR 6/3), moderate 1/4" in diameter.	n below 12.5 feet; co reaction to HCL, ca	olor changes to pale br icium carbonate nodule	own (10 es less than
	52	2.9	A CONTRACTOR OF THE CONTRACTOR						
	. 86/9	3.4	99.7	<u> </u>	ML	sparse fine gravel, gravel fraction coat Stage II cementation	calcium carbonate no ed by calcium carbo n.	amp, very dense, sand dules less than 1/4"in nate.	y SILT; diameter,
20 _		<u>.                                    </u>				Total Depth = 18.3			
Property of the last of the la		<b>.</b>	and head sections.					BORING L	
	N		<b>JO</b>	82 J	M	oore_	}	East Maricopa Floodw Chandler Heights Detention	Basin
			7		<b>V</b>		PROJECT NO. 600198001	DATE 1/02	FIGURE A-25

	LES			CF)		Z	DATE DRILLED		7/13/01	BORING I	٧٥	CI	I-15	
eet)	SAMPLES	BLOWS/FOOT	(%)	DENSITY (PCF)	_	CLASSIFICATION U.S.C.S.	GROUND ELEVA	TION 13	13'		SHEET _	2	OF	2
H H		S/F(	URE	SIT	MBO	FIC. 2.0.9	METHOD OF DR	ILLING C	ME 75, 8" Diame	ter Hollow-S	tem Auge	<u> </u>		
DEPTH (feet)	- E	MO.	MOISTURE	DEN	SYMBOL	SSI U.S	DRIVE WEIGHT	·····	140 lbs. (Auto)		DROP .		30"	
	Bulk	B.	MC	DRY		CLA	SAMPLED BY _					BY _	LLG	
				Δ					ESCRIPTION/IN	TERPRETA	NOIT			
							Groundwater not Backfilled on 7/1	3/01.	ered.					
-							A service and the service and							
-							-							
-							n							
-							W VV							
							PALL TO THE PART OF THE PART O				٠			
25 -														
-		7												
		on the second se												
-														
-														
-														
30 -														
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		*												
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25														
35 -													*	
-														
									•					
-														
											•			
40 -							1							
and the second second	_			<b></b>						ORIN(				
		<b>Y//</b>	74	IU.	8t <b>/</b>	M	oore_			East Maricopa adler Heights	Floodway			
		▼				<b>V</b>		PR	OJECT NO. 600198001	DATE 1/02	***************************************	F	IGURE A-26	

ES			Ģ.		<del></del>	DATE DRILLED	7/13/01	BORING NO.	CH-16	j
(feet) SAMPLES	TO	(%)	(PC		Ó.	GROUND ELEVATIO		_	_ 1 OF	
(fer SAI	)/F0	JRE	ЗІТУ	BOI	ICA C.S	METHOD OF DRILLI	•		ger	
DEPTH (feet)	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DRIVE WEIGHT	140 lbs. (Auto)	DROF	30	17
DEPT Bulk Driven	BLO	MO	3,≺ □		ZLAS	SAMPLED BY M	DE LOGGED BY	MDE REVIEW	ED BYI	LLG
	}		Ö				DESCRIPTION/II	NTERPRETATION		
0	A STATE OF THE STA				CL	ALLUVIUM: Light brown (7.5 Yl Stage I cementation, reaction with HCL.	R 6/4), dry to damp, weakly cemented by	very stiff, silty CLA calcium carbonate, i	Y. noderate	
	15	A THE PROPERTY OF THE PROPERTY								
5	24	5.6	81.1							*
	15					· ·	:			
10	34		And the state of t			Hard.				
	16	2.0	Account of the contract of the		SM	dense, silty SAND.	R 6/4) to light bluish, weakly cemented by			
15	40	2.0								
	70	2.0		- 1	CL	Light brown (7.5 Y Stage I cementation	R 6/4), dry, hard, sil	ty CLAY.		
20	45				SM	Light bluish gray (1 gravel. Stage II cementation	0 B 8/1), dry, very d	ense, silty SAND; s	cattered fine	
20 -							R	ORING L	റദ	
	Ali			R.	AA	oore_		East Maricopa Flood	wav	
		J		A			PROJECT NO.	DATE	FIG	
II.							600198001	1/02	A-	41

	ES.			(PCF)		z	DATE DRILLED	7/13/01	BORING NO	CH-16
et)	SAMPLES	ют	(%)		البيد	CLASSIFICATION U.S.C.S.	GROUND ELEVATIO	N <u>1315</u> '	SHEET	2OF2
DEPTH (feet)	SA	BLOWS/FOOT	MOISTURE	DENSITY	SYMBOL	FICA C.S.	METHOD OF DRILLI	NG CME 75, 8" Diamet	ter Hollow-Stem Auge	er .
-PT	ulk iven	MO	IST	DEN	SYI	SSII U.S	DRIVE WEIGHT	140 lbs. (Auto)	DROP	30"
	Bulk Oriver	BL	M	DRY		CLA	SAMPLED BY MI	DE LOGGED BY _		D BY LLG
				Ω	EFFFFF		Y : 1 . 1 . 1	DESCRIPTION/IN		to down
20		54	3.8	112.8		SM	dense, silty SAND.	OB 8/1) to reddish bro , trace to few cobbles,		
•										
-		49	0.1				Very dense; poor red	covery, cobble fragmer	nts only.	
25 -		87/9" ,								
-		1, 2, 1, 2,				CL	Brown (7.5 YR 5/4) CLAY.	to pale brown (10 YR	6/3), dry to damp,	hard, silty
								, scattered caliche nodu	ıles.	
		Į.								
		50/4"								
30 -						SM	Reddish brown (5 Y gravel.	R 5/4), dry to damp, d	lense, silty SAND; s	sparse fine
		64	1.9	116.7			Stage II cementation coatings on all sides	, gravel fraction has th	in calcium carbonate	9
			1.5							
	15.									
		. 81/9"	3.0			CL		6/3) to reddish brown	(5 YR 5/4), damp, h	nard, silty
							CLAY. Stage II cementation	, thin calcium carbona	te layers less than 1/	8" thick.
				Carried Control			Total Depth = 33.3 Groundwater not en	countered.		
35 -	+	1					Backfilled on 7/13/0			
							ACCUPATION OF THE PROPERTY OF			
	+	1							÷	
Address	+									
40 -										
								В	ORING LO	OG
			ne	<i>IO</i>	<b>&amp;</b>	$\Lambda\Lambda$	oore_		East Maricopa Floodwindler Heights Detention	ìy
			J		A			PROJECT NO. 600198001	DATE 1/02	FIGURE A-28

DEPTH (feet)	Bulk SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	METHOD OF DRILI	7/13/01  ON 1316'  LING CME 75, 8" Diamet  140 lbs. (Auto)  MDE LOGGED BY  DESCRIPTION/IN	ter Hollow-Stem Aug DROP MDE REVIEWE	1 OF 2 er 30"
0		***************************************				CL	ALLUVIUM: Brown (7.5 YR 5/4	4), dry to damp, very sti	ff, silty CLAY with	fine sand.
							Stage I cementation	n, scattered caliche filam	ents.	
							,		<i>y</i>	
-	10.70	15	2.8	103.1						
5 -										
-		12	3.7							
		÷	The second secon							:
-		30	9.5	85.3			Hard.			
		50	9.5	85.5						
10 -										
		18	4.2				Very stiff.			
							Hard.			
		38					Stage I cementation carbonate.	n, scattered fine gravel,	trace filaments of ca	lcium
15 ~	·					SM	Light hluigh gray	(10 B 8/1), dry to damp,	very dense silty S	A ND
13		68				21/1	Stage II cementation carbonate coatings	on, sparse fine gravel, gi	ravel fraction has cal	leium
				Treements of the second						
							The state of the s			
		64	3.3	107.4			Dense.			
				*						
20 -			<u> </u>		ECCULU			В	ORING LO	OG
			M	10	84	M	oore_	Cha	East Maricopa Floodw ndler Heights Detention	ay 1 Basin
Access to the supplier	eu Ant			7	,	7		PROJECT NO. 600198001	DATE 1/02	FIGURE A-29

	LES		<u> </u>	(H)		2	DATE DRILLED	7/13/01	BORING NO.	CH-17
DEPTH (feet)	SAMPLES	BLOWS/FOOT	IRE (%)	DRY DENSITY (PCF)	BOL	CLASSIFICATION U.S.C.S.	GROUND ELEVATION	P	SHEET ter Hollow-Stem Auger	2 OF 2
FPTH		ows	MOISTURE	DENS	SYMBOL	SSIFI U.S.(		140 lbs. (Auto)		30"
ā	Bulk Driven	B	MC	DRY I		CLA	SAMPLED BY M	DE LOGGED BY DESCRIPTION/IN	MDE REVIEWED E	BY <u>LLG</u>
20						SM	ALLUVIUM: (contin	nued)	1011	1
		21	1.3				Brown (7.5 1 R 5/4)	), dry to damp, dense, s	silty SAND; sparse fine	gravei.
						CL	Light heaven (7.5 V	D 6/2) damp darga s	andy CI AV coorse fin	
	- T					CL	Stage II cementation	n, moderately cemented	andy CLAY; sparse fine by calcium carbonate.	e graver.
		68	6.0							
<u> </u>							Total Depth = 24.0 Groundwater not en	countered.		
25 -							Backfilled on 7/13/0	)1.		
,										
-										
									•	
30 -										•
			-							
-									·	
35 -										
			-							
-										
-			The second secon							
40 -				I	<u> </u>			В	ORING LOC	3
					RL A	ΛΛτ	nne		East Maricopa Floodway	

Chandler Heights Detention Basin

PROJECT NO. 600198001 FIGURE A-30 DATE 1/02

	SAMPLES		(%)	oCF)		S	DATE DRILLED		BORING	NO			reflection and the second
DEPTH (feet)	AMI	BLOWS/FOOT	3E (9	DENSITY (PCF)	70°	CLASSIFICATION U.S.C.S.	GROUND ELEVATION		TEN		1	OF <u>2</u>	
HL	$\vdash$	/S/M	MOISTURE	ISNE	SYMBOL	SIFIC	METHOD OF DRILLI DRIVE WEIGHT					30"	
品	Bulk Driven	BLO	MOIS		S	LAS	SAMPLED BY M						
				DRY		Ü	O) ((1))	DESCRIPTION/					·-
5 -		56	7.7	105.0		CL	FILL: Brown (7.5 YR 5/4) rootlets.  Very stiff.	), dry to damp, hard,			e sand, n	O	
Marie Control of the				**************************************			No recovery.						
10 -						SM	Stage I cementation.	), dry to damp, dense , weakly cemented, v	e, silty SANI veak reaction	). with HC	L.		
		24	2.7	108.6		Ci	Few fine sand.						
47	9	93/10"	3.1	**************************************		CL	ALLUVIUM: Pale brown (10 YR Stage I cementation.	6/3), dry to damp, h, scattered caliche file	ard, silty CL aments.	AY with	sand.		
15 -		36											
The state of the s		88/8"	5.1	***************************************									
20		······································	1			***************************************			ORIN	GIO	)G		
	A			<i>In</i>	& 18	ΛΛι	ore_	1	East Marico	pa Floodwa	ìγ		
			7		A	A F.	THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN COL	PROJECT NO. 600198001	DAT	E		IGURE A-31	

(feet)	SAMPLES	BLOWS/FOOT	IE (%)	ΓΥ (PCF)	70	CLASSIFICATION U.S.C.S.	DATE DRILLED GROUND ELEVA	TION 1	318'				2		2
DEPTH (		WS/F	MOISTURE	DENSITY	SYMBOL	SIFIC S.C.	METHOD OF DR						r	30"	
占	Bulk	BLO	MOIS		S	LAS U	SAMPLED BY					_	D BY		
				DRY					DESCRIP						
20		61	11.5	90.4		CL	ALLUVIUM: (co Pale brown (10 ' gravel. Stage II o gravel grains coa	YR 6/3) cementa	, dry to da tion, scatte	mp, harered calie	d, silty Cl the filame	LAY with sents, sand a	and and	d fine	
							Total Depth = 2 Groundwater not Backfilled on 7/2	1.5' t encour							
The state of the s															
25 -															
							-								
					TO THE OWNER OF THE PARTY OF TH				•						
30 -					***************************************									·	
Andrew Control of the													-		
A CONTRACTOR OF THE PARTY OF TH				THE PARTY COLOR OF THE PARTY COL											
				V						•					
35			The state of the s										·		
				The state of the s			- Account								
						and the state of t	4								
40															
	4			7 M 4000		A A -				В		IG LC			
	w/	<b>VII</b>	774	<b>JU</b>	84	N	oore_		PROJECT I		East Mario ndler Heig DA	copa Floodwa hts Detention	y Basin	FIGURE	
		₹				₹			60019800			02		A-32	

	ES			氏		_	DATE DRILLED	7/12/01	BORI	NG NO		CH-19	
et)	SAMPLES	TO	(%)	(PC		01.	1	TION 1318'				***************************************	2
I (feet)	SA	S/F0	URE	SITY	/BOI	ICA C.S	METHOD OF DRI	LLING <u>CME 75, 8"</u>	Diameter Holl				
DEPTH	A E	BLOWS/FOOT	MOISTURE	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DRIVE WEIGHT	140 lbs. (	Auto)	DROP		30"	
D	Bulk Oriven	ద	N N	RY [		CLA	SAMPLED BY	MDE LOGGED	BY <u>MDE</u>	REVIEWE	D BY _	LLG	
				Ω	ECCECCE			DESCRIPTION	ON/INTERPF	RETATION		***************************************	
0						SM	FILL: Brown (7.5 YR 5	5/4), damp, dense, s	ilty SAND.				
	1						. •						
						-							
and the same of th		67	9.3	113.4						•			
							TO COMPANY AND ADDRESS OF THE PARTY AND ADDRES						
5						CL	ALLUVIUM:				**********		
		9	6.8				Light brown (7.5	YR 6/4), damp, stoon, scattered caliche	iff, silty CLA e filaments.	Υ.			
				-				,					
			Value La										
		15					Very stiff.						
									•				
										i			
10 -			***************************************							/			
		38					Hard.						
*													
											٠		
				98.8									
Andrews and the second		78	6.2	98.8									
							44-44-4-4-4-4-4-4-4-4-4-4-4-4-4-4-4-4-						
15 -													
		54	9.1										
							TO COLUMN 100 TO						
							Name of the state						
													•
		65.					Few sand.						
20 -					<i>V././</i>	1	.1		PODI	NC I	<b>1</b> 0		
					بي	ΑΛα	ore_			NG LO ricopa Floodwa ights Detention		p	
Adres on the party of the party			15	<i>y</i>		AF	JULV	PROJECT NO		ights Detention		FIGURE	
		7	-unite-			•		600198001		1/02		A-33	

	LES			CF)		Z	DATE DRILLED	7/	12/01	_ BORIN	G NO	(	CH-19
set)	SAMPLES	TOC	(%)	DENSITY (PCF)		CLASSIFICATION U.S.C.S.	GROUND ELEVATION	ON <u>1318</u>			SHEET	2	OF 2
DEPTH (feet)	8,4	BLOWS/FOOT	MOISTURE	ISIT	SYMBOL	FIC/ C.5	METHOD OF DRILL	ING <u>CM</u>	E 75, 8" Dian	neter Hollov	v-Stem Aug	er	
EPT	주 E	ΜO	IST	DEN	SYL	SSI U.S	DRIVE WEIGHT		140 lbs. (Auto	)	_ DROP		30"
D	Bulk Driven	BL	M	DRY		CLA	SAMPLED BYN		OGGED BY			D BY	LLG
20		***************************************	1			SM	ALLUVIUM: (conti		OINF TIONA	1411111111	IATION		
		38	4.1				Pale brown (10 YR Stage II cementation	(6/3), dr	y to damp, ve	ery dense, s	silty SANE	). ite	
							continuously cemer	nted matr	ix.	o o o ouron		,	
				A SACRAGORIAN AND A SACRAGORIA									
		77	3.1	106.6									
							Total Depth = 24 (	יי		-	<del></del>		
25 -							Total Depth = 24.0 Groundwater not en Backfilled on 7/12/	ncountere '01.	d.				
							,						
						,							
								•				4	
30 -													
						:							
} . 													
1													
-													
35 -													
-													
•													
-													
10											•		
40 -									D	UDIK	IG LO	76	
				In.	& A	AAr	ore_			East Maric	opa Floodwa	V	
e Kere y to case pysi			J	·	A	A F.		PROJ	Ch:	andler Heigh DA	its Detention	Basin	FIGURE
									198001	1/0			A-34

	SAMPLES			(CF)		- Z	DATE DRILLED	7	/11/01	BORIN	G NO	(	CH-20	
eet)	MM	100	(%)	γ (P	7	ATIC 3.	GROUND ELEVATION	ON <u>131</u>	6'	-	SHEET	1	OF	2
H (f	/S	S/F	JRI	ISIT	SYMBOL	) (2.0.	METHOD OF DRILL	ING <u>Cì</u>	ME 75, 8" Diam	eter Hollov	v-Stem Aug	<u>er</u>	·····	
DEPTH (feet)	د د	BLOWS/FOOT	MOISTURE	DEN	SYI	CLASSIFICATION U.S.C.S.	DRIVE WEIGHT		140 lbs. (Auto	)	_ DROP		30"	
	Bulk Oriven	B	Σ	DRY DENSITY (PCF)		CLA	SAMPLED BY M			***************************************	-	D BY	LLG	
<u></u>				Ω	7777			DE	SCRIPTION/I	NTERPRE	TATION			
0						CL	FILL: Pale brown (10 YR silty and sandy CLA Stage I cementation	AY.	brown (7.5 Y)	R 5/4), dry	to damp,	very sti:	ff,	
_		20		A TANAN AND THE PROPERTY OF TH										
5 -														
		12	3.9	98.6			Stiff.							
_		13	4.7				Very stiff.						-	
10 -						ML	ALLUVIUM: Pale brown (10 YR Stage I cementation	. 6/3), d	ry, medium de	nse, SILT	; few grave	l and sa	nd.	
-		31	3.9	109.6		SM	Very pale brown (1) gravel. Stage II cem	0 YR 7.	/4), dry to dan		n dense, sil	ty SAN	D; few	
15 –		48	4.7										· .	
-		50/6"	7.8	88.5										
		75				CL	Pale brown (10 YR Stage II cementation	6/3), d n, few c	ry, hard, silty aliche nodules	CLAY. less than	1/2" in diar	neter.		
20 -					<i>Y//</i>						1011			
					<i>a</i> : .	A A o			В		IG LC			
			14	JU!		AI	ore_			andler Heigl	nts Detention	у Basin	F101100	
	,	₹ .				₹			DJECT NO. 00198001	DA 1/0			FIGURE A-35	

	LES		(1	(F)		Z	DATE DRILLED 7/11/01 BORING NO. CH-20	
DEPTH (feet)	SAMPLES	BLOWS/FOOT	IE (%)	DENSITY (PCF)	OL.	CLASSIFICATION U.S.C.S.	GROUND ELEVATION 1316' SHEET 2 OF 2	
HT (	$\vdash$	WS/I	MOISTURE	NSI.	SYMBOL	SIFIC .S.C	METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger	
DEP	Bulk Driven	31.0	1018	Y DE	Ś	AS.	DRIVE WEIGHT 140 lbs. (Auto) DROP 30"  SAMPLED BY MDE LOGGED BY MDE REVIEWED BY LLG	
	m L			DRY		ਹ	DESCRIPTION/INTERPRETATION	
20	7					CL	ALLUVIUM: (continued) Pale brown (10 YR 6/3), dry, hard, silty CLAY.	
-		49					Stge II cementation, few caliche layers with continuous cementation	
						SP	Pale brown (10 YR 6/3), dry, medium dense, SAND; few fine gravel.	
-		14	1.5				Stage II cementation, continuous coatings on gravel grains, moderate to weak reaction with HCL.	
25 -								
		36	1.3					
The state of the s							Total Depth = 26.5'	
							Groundwater not encountered. Backfilled on 7/11/01.	
-								
							•	
30 -								
-								
-								
25			ALLES AND			•		
35 -								
	H							
			-					
			- Anna Anna Anna Anna Anna Anna Anna Ann	`				
40 -								
70				· · · · · · · · · · · · · · · · · · ·			BORING LOG	
				In	SL I	$\Lambda\Lambda$	East Maricopa Floodway Chandles Heights Detention Books	

Chandler Heights Detention Basin

FIGURE A-36 PROJECT NO. 600198001 DATE 1/02

CL FILL: Brown (7.5 YR 5/4), dry to damp, very stiff, silty CLAY.    12	DEPTH (feet)	Bulk SAMPLES Driven	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED 7/12/01 BORING NO. CH-21  GROUND ELEVATION 1315' SHEET 1 OF 2  METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger  DRIVE WEIGHT 140 lbs. (Auto) DROP 30"  SAMPLED BY MDE LOGGED BY MDE REVIEWED BY LLG  DESCRIPTION/INTERPRETATION
Brown (7.5 YR 5/4), dry to damp, medium dense, SILT.  Hard. Stage I cementation.  CL Brown (7.5 YR 5/4), dry to damp, very stiff, silty CLAY.  Stage I cementation.  34  Pale brown (10 YR 6/3), dry, dense, silty SAND.  Stage II cementation.  Trace fine gravel.				6.0	91.4		CL	Brown (7.5 YR 5/4), dry to damp, very stiff, silty CLAY.
Stage I cementation.  Stage I cementation.  SM Pale brown (10 YR 6/3), dry, dense, silty SAND. Stage II cementation.  Trace fine gravel.  BORING LOG	The state of the s		35	5.1	85.9		ML	Brown (7.5 YR 5/4), dry to damp, medium dense, SILT.  Hard.
Stage II cementation.  Trace fine gravel.  BORING LOG	10 -			4.7			CL	Brown (7.5 YR 5/4), dry to damp, very stiff, silty CLAY. Stage I cementation.
BORING LOG	15			2.8			SM	Stage II cementation.
Chandler Heights Detention Basin	20 -						AAc	BORING LOG

PROJECT NO. 600198001

DATE 1/02

FIGURE A-37

	SAMPLES	<u> </u>	(%)	(PCF)		NOI	DATE DRILLED			
DEPTH (feet)	SAM	BLOWS/FOOT	JRE (	DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	GROUND ELEVATION 1			2 OF 2
PTH	) Li	OWS	MOISTURE	DENS	SYM	SSIF U.S.	DRIVE WEIGHT			30"
G	Bulk Driven	BL	MO	DRY [		CLA	SAMPLED BY MDE			BY LLG
20						SM	ALLUVIUM: (continued	DESCRIPTION/INT	TERPRETATION	
	, and	34	1.9	-		0141	Pale brown (10 YR 6/3)	, dry, medium dens	e, silty SAND.	
						٠.	Stage II cementation.	÷		
	+							•		
				100.5			7	. 1		
		45	1.4	108.5			Dense; scattered fine gra	avei.		
		20								
25 -	-	38					Medium dense.			
							Total Depth = 25.5' Groundwater not encour	ntered.		
The state of the s	ě						Backfilled on 7/12/01.			
The state of the s										
7.0										
30 -										
			THE PARTY OF THE P	AND THE REAL PROPERTY OF THE PERSON OF THE P						
A										
				A VICTOR AND A VIC		-				
35 -							•			
	+									
				Passana a da de la companya de la co						
40 -								R/	RING LO	ß
					به	AA	nnre –		ast Maricopa Floodway	

\_*Minyo & M*oore\_

East Maricopa Floodway Chandler Heights Detention Basin

PROJECT NO. DATE FIGURE 600198001 1/02 A-38

DEPTH (feet)	Bulk SAMPLES	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (PCF)	SYMBOL	CLASSIFICATION U.S.C.S.	DATE DRILLED 7/12/01 BORING NO. CH-22  GROUND ELEVATION 1319' SHEET 1 OF 2  METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger  DRIVE WEIGHT 140 lbs. (Auto) DROP 30"  SAMPLED BY MDE LOGGED BY MDE REVIEWED BY LLG
0				11	///	CL.	DESCRIPTION/INTERPRETATION FILL:
5 -		81/11" 18				CL	Brown (7.5 YR 5/4), dry to damp, hard, silty CLAY. Stage I cementation, weak cementation by trace of caliche filaments.  Very stiff.
10 -						CL	ALLUVIUM:
15 -		26 27 79	5.8 6.9	91.6			Light brown (7.5 YR 6/4), dry to damp, very stiff to hard, silty CLAY.  Stage I cementation, few to some caliche filaments.  Hard.
20 -		100	6.6				
	A		)		_	<b>A A</b> -	BORING LOG
		M/I/I			Et 1	M	East Maricopa Floodway Chandler Heights Detention Basin

FIGURE A-39 PROJECT NO. 600198001 DATE 1/02

	ES			CF)		2	DATE DRILLED	7/12/01	BORING N	0	CH-22
eet)	SAMPLES	TOC	(%)	DENSITY (PCF)	7	CLASSIFICATION U.S.C.S.	GROUND ELEVATION	ON 1319'	S	HEET2	OF 2
DEPTH (feet)	S.	BLOWS/FOOT	MOISTURE	TISI	SYMBOL	FIC.	METHOD OF DRILL	ING CME 75, 8" Dia	meter Hollow-Ste	m Auger	
EPT	Bulk Driven	MO_	TSIC		SXI	ASSI U.S	DRIVE WEIGHT	140 lbs. (Auto	0)	DROP	30"
Ω	Driv	窗	Ž	DRY		CL	SAMPLED BY M				LLG
20						CL	ALLUVIUM: (contin	DESCRIPTION/	INTERPRETAT	IUN	
	1,500	89					Light brown (7.5 Y	R $6/4$ ), dry to damp,	hard, silty CLA	AY.	
-			-								
		44	7.9								
-											
25						SM	Brown (7.5 YR 5/4	), dry to damp, dense n, carbonate grain co	e, silty SAND.		
25	1	44	6.3	108.6			Stage if cememation	i, caroonate gram co.	atings.		
-	-	****	0.3	108.0							
-							Total Depth = 26.5 Groundwater not en	ocountered			
			-	M. ALLEAN AND DESCRIPTION			Backfilled on 7/12/0				
-				***************************************							
				Annual of the state of the stat							
30 -				-							
-				ATT A STATE OF THE							
-			- Canada								
				-							
35 -				To the state of th							·
				The second secon				•			
-											
				Market Control (Market Control							
				No. of the Confession of the C							
-	-		**************************************	Name of the latest of the late							
40 -											
					<u> </u>		THERMOSE	E	BORING	LOG	
	_/	V/Ž	n	10	82 <b>/</b>	M	00.6		East Maricopa I handler Heights D	Floodway	
				,	#			PROJECT NO. 600198001	DATE 1/02		FIGURE A-40

	SAMPLES			(CF)		Z	DATE DRILLED	,	7/12/01	BORIN	IG NO	CI	H-23	
eet)	\MP	BLOWS/FOOT	(%) =	У (Р	7	CLASSIFICATION U.S.C.S.	GROUND ELEVATION				<del>-</del>		OF	1
DEPTH (feet)	/S	/S/F	MOISTURE	TIS!	SYMBOL	<u> </u>	METHOD OF DRILL	ING C	ME 75, 8" Diam	eter Hollo	w-Stem Auge	r		
EPT	₹ C	ŏ-	TSIC	DEN	SΥ	vssi U.S	DRIVE WEIGHT		140 lbs. (Auto)		_ DROP		30"	
O	Bulk Driven	18	Σ	DRY DENSITY (PCF)		CLA	SAMPLED BY M		LOGGED BY		<del>_</del>	D BY _	LLG	
0						CL	FILL: Brown (7.5 YR 5/4	l) dry	to damp hard	silty CLA	Y			
-							BIOWII (7.5 TR 57-	i), ui j						
***														
-		07	2 4	109.6										
	3,	87	3.4	109.6			TABLE COURT AND					٠		
_														
5 -														
		30	6.1											•
-														
-					HILL	C) 141	70 (T.E.V.D. 6/4		- had alter C	T A W				~~~~
						CL-ML	Brown (7.5 YR 5/4 Stage I cementation	i), dam i, trace	p, nard, sitty C caliche.	LAI.				
-		50	3.7	100.9										
-														
			L						•					
10 -						CL	ALLUVIUM:		1 4 1	:cc:				
		13	6.2				Pale brown (10 YR Stage II cementation	n, few	ary to damp, ve caliche nodules	ry suir, si less than	ilty CLA I. 1/2" in dian	neter.		
	H													
-														
_														
		65	•				Hard.		4					
-			1											
15				<u> </u>		,								
		91	5.2											
-		21.	3.2				- Augustus de la companya de la comp							
			ļ								CTY M			
						ML	Pale brown (10 YR Stage II cementation	t 6/3), in, scat	ary to damp, ve tered caliche no	ry dense, dules less	than 1/2" in	• !		
		73	4.3	107.2			diameter.							
		<del></del> ~				·····	Total Dest 107	Λ¹						
30							Total Depth = 19.0 Groundwater not er Backfilled on 7/12/	ncount	ered.					
20 -				······································					R	ORIF	VG LC	) (G	· · · · · · · · · · · · · · · · · · ·	***************************************
11								11			THE PARTY NAME OF			
				In	&	$\Lambda\Lambda$ 1	ore_	]		East Mari	copa Floodwa	٧		

	ES	- And the		CF)		z	DATE DRILLED	7/12/01	BORING	NO.	• (	CH-24	
et)	SAMPLES	JOT	(%)	DENSITY (PCF)		CLASSIFICATION U.S.C.S.	GROUND ELEVATION	ON <u>1316'</u>		SHEET	1	OF _	2
1 (fe	SA	S/F(	URE	SIT	ABO	5.5. 5.5.	METHOD OF DRILL	ING CME 75, 8" Diam	eter Hollow-S	Stem Aug	er		
DEPTH (feet)	A CE	BLOWS/FOOT	MOISTURE	OEN	SYMBOL	SSII U.S	DRIVE WEIGHT	140 lbs. (Auto	)	DROP	w	30"	
ă	Bulk Driven	В	Σ	DRY I		CLA	SAMPLED BY M	DE LOGGED BY			D BY	LLC	3
					7777			DESCRIPTION/I	NTERPRET	ATION			
0						CL	ALLUVIUM: Brown (7.5 YR 5/4	), dry to damp, very s	tiff, silty CL	AY.			
	H						Stage I cementation	•					
			-										
							-						
-		22	3.4	94.7									
		<i>LL</i>	3.4	94./									
_													
5 -													
	ľ	10								-			
-	-/	10											
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			-				T 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7						
-		1.77											
		17	6.4										
-													
10 -													
							TT. T						
-		27					Hard.						
-						•							
-		65/11"	5.8	91.0			·						
-											·		
15 -													
							***	11 . 7.					
	H	32	5.2				Weak cementation b	by caliche.					
-						SM	Pale brown (10 YR	6/3), dry to damp, ve	ery dense, sil	ty SAND	; scatte	red	
-							fine subrounded to Stage II cementation	rounded graver. n, carbonate coatings (	on grains.				
		90	6.6	109.4									
20 -									***************************************				
20 **								R	ORIN	GIC	)G		
					ربع	AA	oore_		East Maricon andler Heights				
And the deplement		<b>Y</b>	5	<b>y</b>		A F		Ch PROJECT NO.	andler Heights		Basin	FIGURE	
		•	-			7		600198001	1/02			A-42	

	ES	:		CF)		z	DATE DRILLED 7/12/01 BORING NO. CH-24	
eet)	SAMPLES	DOT	(%)	DENSITY (PCF)		CLASSIFICATION U.S.C.S.	GROUND ELEVATION 1316' SHEET 2 OF	2
H (f	S	/S/F	L L	ISIT	SYMBOL	F.C.	METHOD OF DRILLING CME 75, 8" Diameter Hollow-Stem Auger	
DEPTH (feet)	Bulk Driven	BLOWS/FOOT	MOISTURE		SΥ	ASSI U.9	DRIVE WEIGHT 140 lbs. (Auto) DROP 30	
Δ	Driv	面	Ē	DRY		CF/	SAMPLED BY MDE LOGGED BY MDE REVIEWED BY I	_LG
20					777	CL	ALLUVIUM: (continued)	
		37	5.8	·			Pale brown (10 YR 6/3), dry to damp, hard, sandy CLAY.	
-								
-						SM	Pale brown (10 YR 6/3), dry, very dense, silty SAND.	
	é					3(4)	Stage II cementation, carbonate coatings on grains.	
		89						
_		······································				·····	Total Depth = 24.0'	
							Total Depth = 24.0' Groundwater not encountered. Backfilled on 7/12/01.	
25 -							Backfilled on 7/12/01.	
_								
			L. Territoria Constantini					
				The state of the s				
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30 -								
					CL-) The second			
35 -								
	$\prod$							
40 -				<u></u>				
	4	0	)			<b>A A</b>	BORING LOG	
	_/		na	O	82	M	East Maricopa Floodway Chandler Heights Detention Basin  PROJECT NO DATE FIGURE	
0				,	,444	<b>V</b>	PROJECT NO. DATE FIGURE 600198001 1/02 A-4	

	ES			Œ		z	DATE DRILLED	7/12/01	BORING NO.	CH-25
et)	SAMPLES	TOC	(%)	(P)		OE .	GROUND ELEVATION	N 1312'	SHEET	IOF2
DEPTH (feet)	SA	BLOWS/FOOT	MOISTURE	DENSITY (PCF)	SYMBOL	CA C.S	METHOD OF DRILLI	NG CME 75, 8" Diame	eter Hollow-Stem Aug	er
PTF		3MC	IST	EN	SYIV	SSIF U.S.	DRIVE WEIGHT	140 lbs. (Auto)	DROP	30"
B	Bulk riven	BL(	MO	DRY C	0.	CLASSIFICATION U.S.C.S.	SAMPLED BY M	DE LOGGED BY	MDE REVIEWE	D BY LLG
		,		H		0			NTERPRETATION	
0						CL	ALLUVIUM:	6/2) den silter CT AV		
-							Pale brown (10 1 K	6/3), dry, silty CLAY	•	
-						SM	Pale brown (10 YR	6/3) to light bluish gra	av (10 B 8/1), dry, n	nedium
							dense, silty SAND. Stage I cementation.		, , , , , , , , , , , , , , , , , , , ,	
-		15	1.1	96.1			Stage I cementation.			
-	<u>.</u>						Particular of the Control of the Con			
1										
5 -										
	1	16	1.3				Trace fine gravel.			
-										
	7.						- - - - - -			
-		49				CL	Pale brown (10 YR	6/3) to brown (7.5 YF	8 5/4), damp, hard, s	silty CLAY.
		.,					Stage I cementation.		**	•
-										
10 -										
	7	71/10"								
-	$-\Box$									
-										
		36	5.5	105.7						
-										
1.5										
15 -										
-		32								
-						GM	Pale brown (10 YR	6/3) to light bluish gr	ay (10 B 8/1), dry to	damp, very
				A THE PERSON NAMED IN COLUMN N			dense, silty GRAVE Stage II cementation	EL with sand.		
		92								
***************************************										
THE PARTY OF THE P										
20 -			=======================================	J	raikt		]			3.0
	A				۵٠	AA			ORING LO	
		VII	14	JU!	EL A	/VI	oore_		East Maricopa Floodw andler Heights Detention	
		▼				V		PROJECT NO. 600198001	DATE 1/02	FIGURE A-44

THE PARTY OF THE P	SAMPLES	_		CF)		Z	DATE DRILLED _		7/12/01	BORING N	10	C:	H-25	
eet)	\MP	BLOWS/FOOT	MOISTURE (%)	DENSITY (PCF)	7	CLASSIFICATION U.S.C.S.	GROUND ELEVAT	TION <u>13</u>	312'		SHEET _	2	OF	2
DEPTH (feet)			URI	TISI	SYMBOL	FIC.	METHOD OF DRI	•						
EPT	Bulk Driven	VO_	USIC	DEN	λS	ASSI U.S	DRIVE WEIGHT							
	P P	В	Ž	DRY		CL/	SAMPLED BY					BY _	LLG	
20					ELLERIN	SM	ALLUVIUM: (cor		ESCRIPTION/IN	IERPRETA	HON			
		76/11"	4.0	116.0		JIVI	Pale brown (10 Y dense, silty SAN) Stage II cementati	'R 6/3) i D with s	to light bluish gray	7 (10 B 8/1)	, dry to d	amp, v	ery	
							Total Depth = 2: Groundwater not Backfilled on 7/1	l .4' encount	ered.					
And the second of the second o										·				
CONTRACTOR OF THE PROPERTY OF		**************************************												
25 -		ing control of the co					The state of the s							
ATTENDED TO A STATE OF THE ATTENDED TO A STATE O						-								
The state of the s														
30 -		And the state of t												
And the second s		- Table 1	Townson											
		And the second s	Annual Control of the											
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35 -					THE PARTY OF THE P									
The state of the s						Control of the Contro							٠.	
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Programme of the state of the s						Anna de company para de la compa								
40 -														
			)							DRING				
			M	IO	&	M	oore_		Char	East Maricopa idler Heights	Floodway Detention B	lasin		
				7			Emilia Com	Р	ROJECT NO. 600198001	DATE 1/02			FIGURE A-45	

it)	SAMPLES	To	(%)	DENSITY (PCF)		NOL	DATE DRILLED		BORING NO	CH-26 1 OF 2
1 (feet)	SAN	BLOWS/FOOT	MOISTURE	SITY	SYMBOL	CLASSIFICATION U.S.C.S.		NG <u>CME 75, 8" Diame</u>		***************************************
DEPTH	A G	ΝO.	JIST	DEN	SYN	SSIF U.S	DRIVE WEIGHT	140 lbs. (Auto)	DROP	30"
D	Bulk Driven	园	M	DRY		CLA	SAMPLED BY MI	DE LOGGED BY		D BY LLG
0	-			. 🗀	777	CL	ALLUVIUM:	DESCRIPTION/IN	TERPRETATION	
J						OL.	Light brown (7.5 YF silty CLAY.	R 6/4) to brown (7.5 Y	R 5/4), dry to damp	o, very stiff,
							Stage I cementation.			
-										
	- (3g)									
		19	3.7	94.6						
5										
	Į.	18								N.
-	i, editor		-							
_										
-	7	29	6.0	A TANKA DA T			Hard.			
-										
10 -										
		60	4.8	104.9						
_		00	4.0	104.9						
-			ļ				70.1	C/O\ 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ita- CANTNita	- C
						SM	Pale brown (10 YR)	6/3), dry, medium den	se, shiy sand whi	i fine gravel.
-	7	17	1.5							·
_										
	-		ļ			GM	Pale brown (10 YR	6/3) to light bluish gra	y (10 B 8/1), dry, v	ery dense,
15 -							silty GRAVEL with Stage II cementation	fine sand; trace cobble	es.	
-		84								
		68	1.7							
-										
20 -					31.61.6U		<u> </u>	R/	ORING LO	
The same of the sa	A			m	<b>&amp;</b> 1	AA	oore_		East Maricopa Floodw	ay
	y A		J			A F.		PROJECT NO. 600198001	ndler Heights Detention DATE 1/02	FIGURE A-46

et)	SAMPLES	ОТ	(%)	DRY DENSITY (PCF)		CLASSIFICATION U.S.C.S.	DATE DRILLED				S NO			2
DEPTH (feet)	SAI	BLOWS/FOOT	MOISTURE (%)	SITY	SYMBOL	ICA C.S	METHOD OF DRILL						***************************************	
TL	유	-MO	IST	DEN	SYN	SSIF U.S	DRIVE WEIGHT	140 lbs. (	Auto)		DROP _	····	30"	·····
ă	Bulk Driven	뮵	MC	RY I		CLA	SAMPLED BY M					BY _	LLG	
				Ω	EFFER	C 3 d	ATTYNYTTE.	DESCRIPTIO	ON/IN	TERPRET	ATION			
20		50/4"	5.3	105.0		SM CL	ALLUVIUM: (continue) Pale brown (10 YR) Stage II cementation	6/3) to light bluis ne gravel; trace co n, carbonate coati	obbles. ngs on	grains.			e,	
							Brown, dry to damy Total Depth = 21.5		Y with	h sand.				
LALL THE		;			-		Groundwater not en Backfilled on 7/12/	countered.						
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20 APR - 10 Apr -		YII	45	JU!	or I	AI	oore_	PROJECT NO	Chan	dler Height	s Detention E	Basin	FIGURE	
		7	- Table			•		600198001		1/0:			A-47	

DATE EXCAVATED 11/26/01 TEST PIT NO. TP-4	GROUND ELEVATION LOGGED BY MDE	LOCATION 0.1 Mi. N of CH-3 on EMF Access Rd., E of Fill Section	DESCRIPTION		ALLUVIUM: Light reddish brown (5 YR 6/4), loose to dense, dry to damp, clayey SILT. Few rootlets from 0-6 feet bgs. Stage I cementation, scattered caliche stringers less than 1/4" long, moderate reaction with HCL, very weakly cenented by calcium	carbonate.			@ 10 feet bgs, Stage II cementation with scattered caliche filaments, forming discontinuous, hard, cobble to fine gravel size lenses of cemented clayey silt up to 1/2" thick and 5" diameter, strong reaction with HCL within silt and lenses.	Total Depth = 12 feet. Groundwater not encountered during drilling. Backfilled on 11/26/01.	Excavation Bearing: 200°						
N	DITA:	ASSIFIC D.S.U	CF/		ML			**************									7
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78 O	Y P	East Maricopa Floodway Chandler Heights Detention Basin													A CANADA A C		
DE	TEST	East Nundler I	NO.														ft.
		ď	PROJECT NO.	600198001													1 in./5 ft
			PRO.	09													
																	SCALE

DATE EXCAVATED 11/27/01 TEST PIT NO. TP-5	GROUND ELEVATION LOGGED BY MDE	METHOD OF EXCAVATION Backhoe, Ford 555 E	LOCATION 40'N of CH-6 (MW), E Side of EMF Access Road	DESCRIPTION		ALLUVIUM: Dark yellowish brown (10 YR 4/4), dry to damp, stiff to very stiff,	Stage I cementation, weakly cemented, scattered calcium carbonate filaments less than 1/4" long, moderate reaction with HCL.	Strong brown (7.5 YR 4/6), dry to damp, medium dense to dense, clavey SILT; scattered rootlets, scattered pinhole porosity.	Stage I cementation, moderate reaction to HCL, weakly to non- cemented, scattered calcium carbonate filaments.			@ 10-12 feet, cementation increases slightly to weakly cemented by calcium carbonate.	Total Depth = 12 feet. Groundwater not encountered during drilling. Backfilled on 11/27/01.	Excavation Bearing: 185°					
N	OIT.	ASI C.S	,551F .2.U	ζΓ∖		J		ML					÷	٠.					
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		201	a Floodway Detention Basin	DATE	1/02			100											Annual
Vinto « Moore	10 +01+	IESI PII LUG	East Maricopa Floodway Chandler Heights Detention Basin	PROJECT NO.	600198001														SCALE = 1 in./5 ft.

			SET	(40	N	DATE EXCAVATED 11/26/01 TEST PIT NO. TP-6
TU FOLK		(13	***********	)심) /	OIT.	GROUND ELEVATION LOGGED BY MDE
ES ES ES	5 P P P	] ] ]		7118	C.S	METHOD OF EXCAVATION Backhoe, Ford 555 E
East Maricopa Floodway Chandler Heights Detention Basin	va Floodway Detention Basin	EPTH	eno Gone JTSIC	DENE	1887 U.S.	LOCATION 500'S of CH-6, E Side of EMF Access Road
PROJECT NO.	DATE	Ia Ia		\7月(	√70	DESCRIPTION
600198001	1/02		°S	а		
		0			r T	<u>ALLUVIUM</u> :
			-	-	MIL	Reddish brown (5YR 4/4), stiff to very stiff, dry to damp, silty CLAY; scattered calcium carbonate filaments less than 1/4"long,
						scattered pinhole voids, trace sand. Stage I cementation, weakly cemented.
		· ·				Yellowish-red (5 YR 5/6), soft to dense, damp, clayey SILT; scattered calcium carbonale filaments un to 1/4" long, trace to few ninhole
		<u> </u>				voids, trace fine sand, weakly cemented.
			····		SM	@ 5 teet bgs, increase in amount of cementation by calcium carbonate, few weakly cemented caliche nodules less than 0.5" in diameter,
						color change to reddish-yellow (7.5 YR 7/6), loose to medium dense, dry to damp, clayey SILT; moderate reaction with HCL, few to no
		<u> </u>				calcium carbonate filaments. @ 4 feet bgs, color changes to light brown (7.5 YR 6/4),
		2				fine sand increases from trace to sparse, damp, loose, sandy SILT; trace fine gravel.
						Stage I cementation, little to no calcium carbonate cementation.
						Reddish-brown (5 YR 5/3), damp, loose to medium dense, silty fine SAND with sparse fo few fine gravel; trace coarse gravel.
		4				Stage I cementation, strong reaction with HCL, cementation weak to non-cemented.
		9				@ 12 feet bgs, Stage I cementation, increase in amount of weak calcium carbonate cementation, sand breaks into hard fragments up to 4" across, no filaments or nodules observed.
						Total Depth = 12.5 feet. Groundwater not encountered during drilling.
		20				Dackfulled Oil 11/20/01.
					· · · · · · · · · · · · · · · · · · ·	Excavation Bearing: 197
					***************************************	
		į.				
		3				
SCALE = 1 in./5 ft.				-		

#### APPENDIX B

### LABORATORY TESTING

### Classification

Soils were visually and texturally classified in accordance with the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488-93. Soil classifications are indicated on the logs of the exploratory excavations in Appendix A.

### Moisture Content

The moisture content of samples obtained from the exploratory excavations was evaluated in accordance with ASTM D 2216-92. The test results are presented on the logs of the exploratory excavations in Appendix A.

### In-Place Moisture and Density Tests

The moisture content and dry density of relatively undisturbed samples obtained from the exploratory excavations were evaluated in general accordance with ASTM D 2937-94. The test results are presented on the logs of the exploratory excavations in Appendix A.

### **Gradation Analysis**

Gradation analysis tests were performed on selected representative soil samples in general accordance with ASTM D 422-63. The grain-size distribution curves are shown on Figures B-1 through B-48. These test results were utilized in evaluating the soil classifications in accordance with the Unified Soil Classification System.

#### **Atterberg Limits**

Tests were performed on selected representative fine-grained soil samples to evaluate the liquid limit, plastic limit, and plasticity index in general accordance with ASTM D 4318-98. These test results were utilized to evaluate the soil classification in accordance with the Unified Soil Classification System. The test results and classifications are shown on Figures B-49 through B-54.

### Hydroconsolidation (Settlement Potential) Tests

Hydroconsolidation tests were performed on selected relatively undisturbed soil samples in general accordance with ASTM D 2435-96. The samples were inundated during testing to represent adverse field conditions. The percent of consolidation for each load cycle was recorded as a ratio of the amount of vertical compression to the original height of the sample. The results of the tests are summarized on Figures B-55 through B-59.

**Expansion Index Tests** 

The expansion index of selected materials was evaluated in general accordance with U.B.C. Standard No. 18-2. Specimens were molded under a specified compactive energy at approximately 50 percent saturation (plus or minus 1 percent). The prepared 1-inch thick by 4-inch diameter specimens were loaded with a surcharge of 144 pounds per square foot and were inundated with tap water. Readings of volumetric swell were made for a period of 24 hours. The results of these tests are presented on Figure B-60.

Maximum Dry Density and Optimum Moisture Content Tests

The maximum dry density and optimum moisture content of selected representative soil samples were evaluated in general accordance with ASTM D 698. The results of these tests are summarized on Figures B-61 through B-64.

Soil Corrosivity Tests

Soil pH and minimum resistivity tests were performed on representative samples in general accordance with Arizona Test 236b. The chloride content of selected samples was evaluated in general accordance with Arizona Test 722. The sulfate content of selected samples was evaluated in general accordance with Arizona Test 733. The test results are presented on Figure B-65.

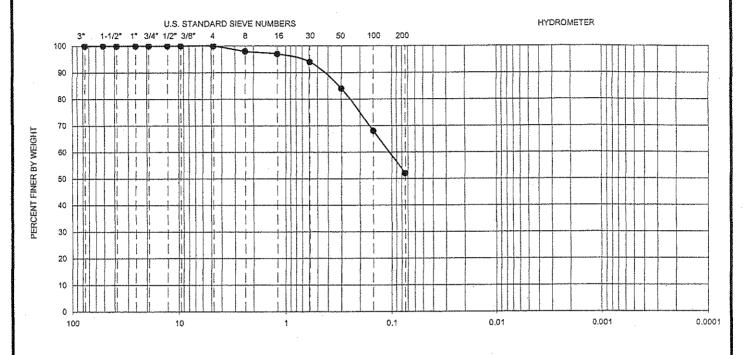
Permeability Tests

Constant head permeability tests were performed on selected undisturbed (and remolded) soil samples in general accordance with ASTM D 2434-68. The samples were placed in the apparatus and saturated. Water flow through the soil was sustained using a pneumatically induced head at specified pressures. The quantity of flow, the elapsed time, and the hydraulic gradient were recorded. The permeability was then calculated using Darcy's equation. The results of the tests are presented on Figure B-66.

Unconsolidated Undrained Triaxial Compression Tests

Triaxial compression tests were performed on selected remolded and undisturbed samples in general accordance with ASTM D 2850-95. The test results are shown on Figure B-67.

GRA'			SAND			FINES
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
•	CH-1	7.5-9		<b>-</b> . •			-		-	***	52	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

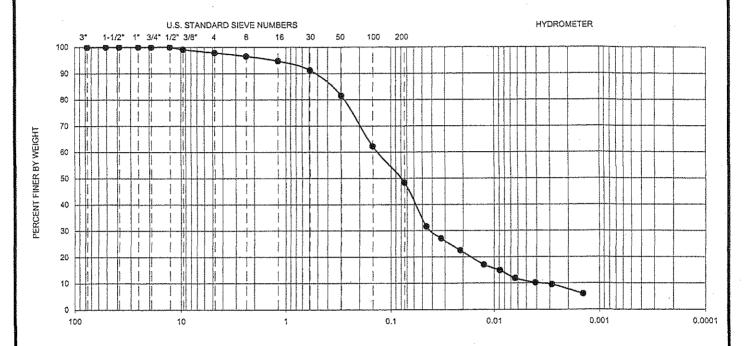


## **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
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-	GRAV			SAND		FINES				
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C <sub>3</sub>	င	Passing No. 200 (%)	U.S.C.S
۵	CH-1	20.0-21.5	-	*	NP	0.004	0.04	0.14	37.0	3.3	48.38847	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

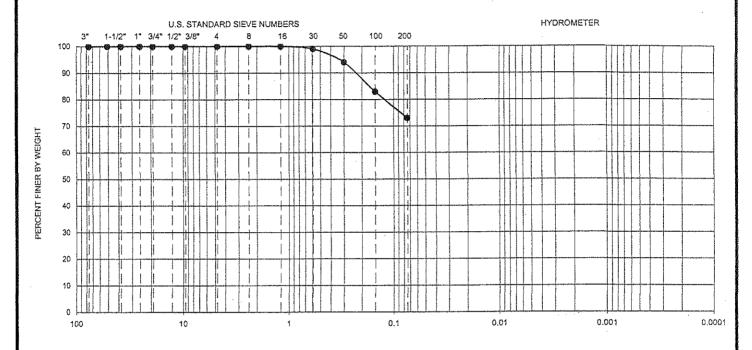


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Coarse	Fine	Coarse	Medium	Fine	Clay



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	C <sub>c</sub>	Passing No. 200 (%)	u.s.c.s
. 8	CH-2	5-6.5	21	16	5			-	-		73	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

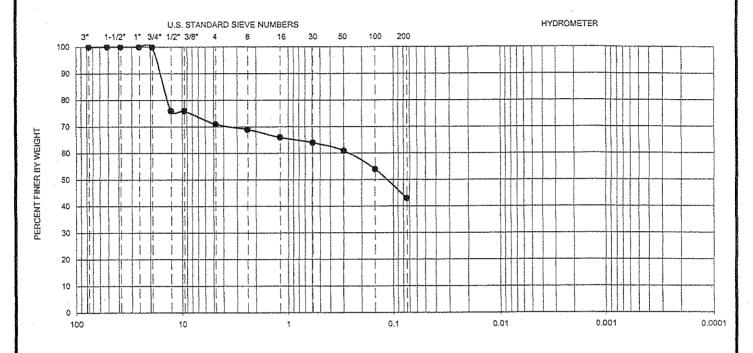
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EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

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GRAV	/EL		SAND			FINES
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	Cc	Passing No. 200 (%)	U.S.C.S
	CH-2	15-16.5	28	16	12				_		43	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

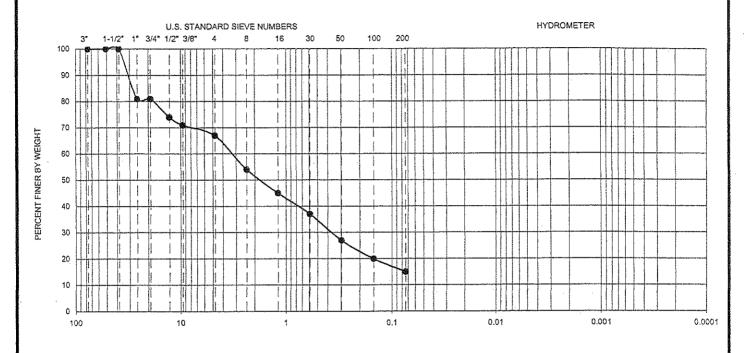


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CHANDLER HEIGHTS DETENTION BASIN
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	GKAV	EL.	<u> </u>	OMIND		FINCO					
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	!			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>80</sub>	Сª	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
8	CH-3	15-16.5			-1			-		Parasis.	15	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

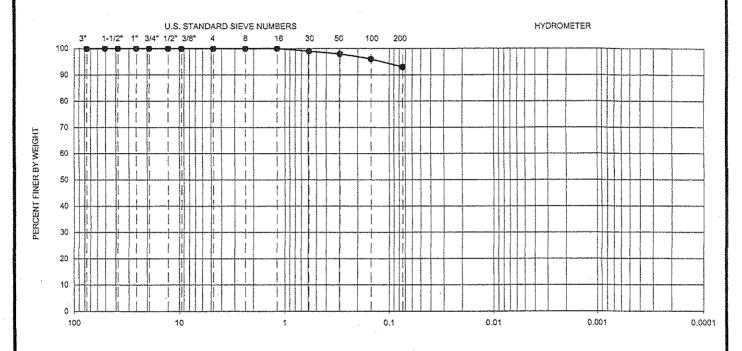


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CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

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	GRAV			SAND		FINES				
-	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cª	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
6	CH-4	7.5-9	42	22	20				-	-	93	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

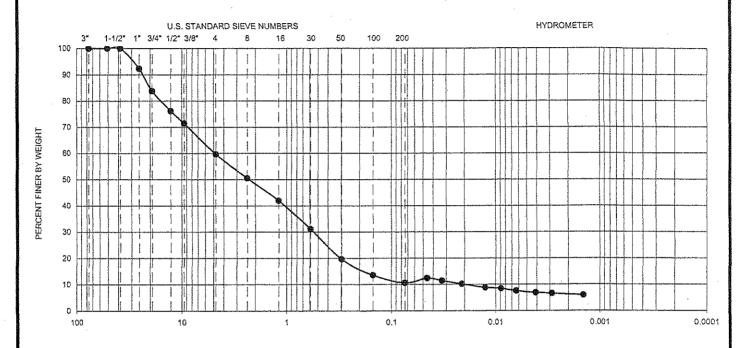
\_*Ninyo & M*oore \_

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GRAV	/EL		SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Sitt	Clay			



Symbol	Hole No.	Depth (ft)	Liquíd Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
6	CH-4	17.5-19.0	-	-	NP	0.019	0.57	4.87	249.7	3.4	11	SP-SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

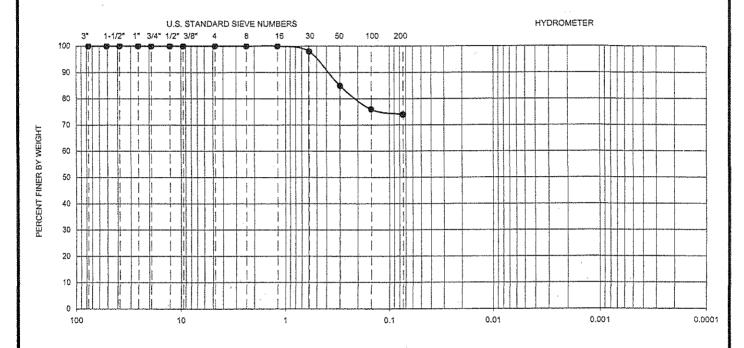
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GRAV	'EL		SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C <sub>u</sub>	C°	Passing No. 200 (%)	U.S.C.S
6	CH-5	5-6.5	29	19	10	<b></b>					74	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

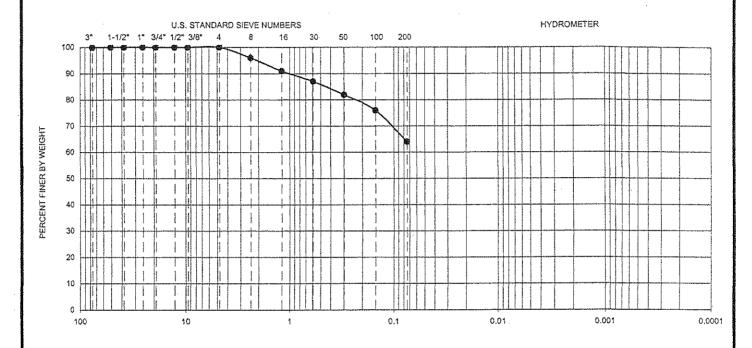
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### **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
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GRA\	/EL		SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
6	CH-5	15-16.5									64	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

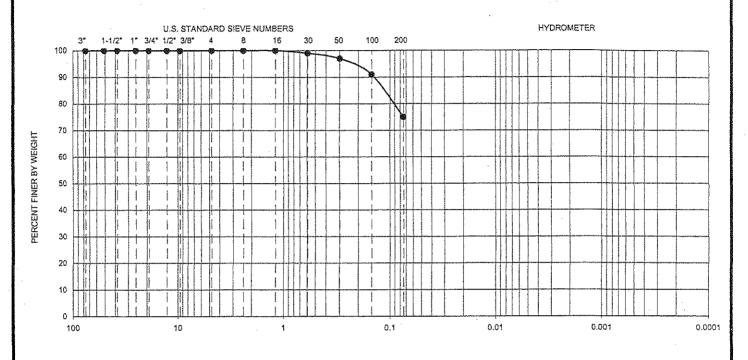
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ı	GRAV	EL.		SAND		FINES				
Ì	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Сп	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
•	CH-6	7.5-9									75	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

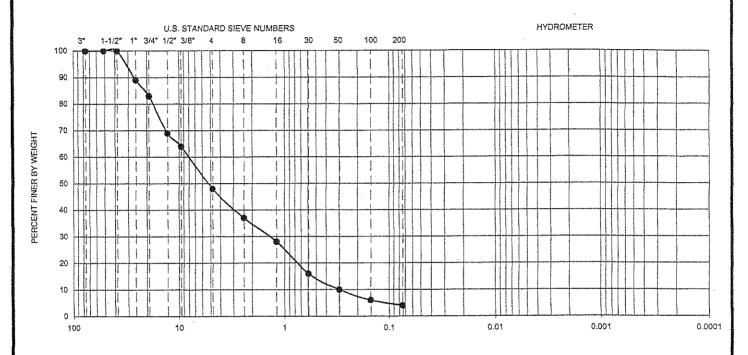
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ĺ	GRAV	EL		SAND		FINES			
ĺ	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		



Sy	/mbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C <sub>u</sub>	C <sub>s</sub>	Passing No. 200 (%)	U.S.C.S
	8	CH-6	17.5-19	NA SE	**					•		4	SM

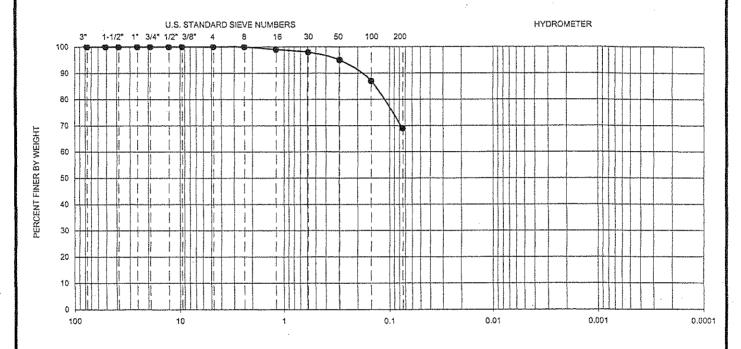
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

## **GRADATION TEST RESULTS**

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GRAV			SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



***************************************	Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C,	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
	•	CH-7	5-6.5	****			10 m				-	69	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

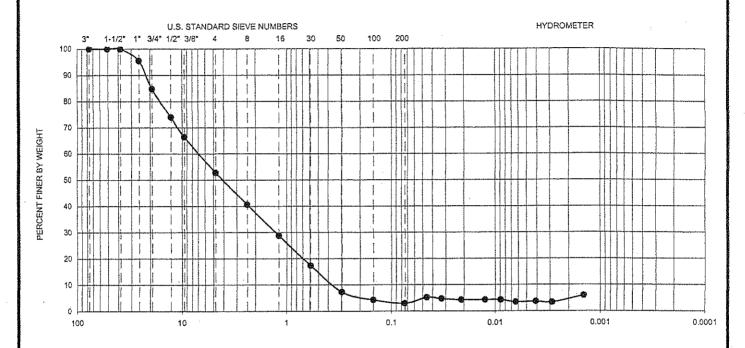


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EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
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	GRAV			SAND		FINES				
į	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



, Sy	mbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
	•	CH-7	15.0-16.5		•	NP	0.379	1.30	7.25	19.1	0.6	3 ,	SP

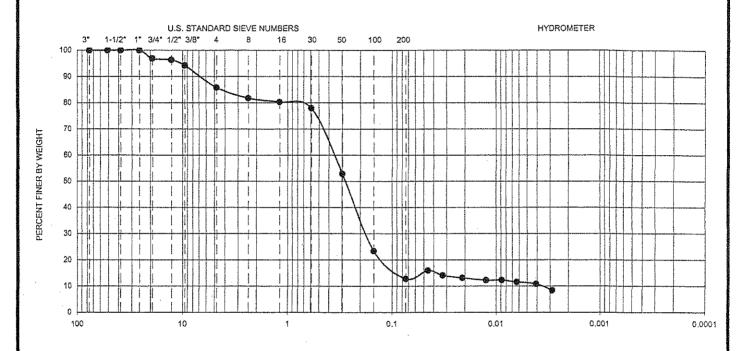
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

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GRAV	/EL		SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>so</sub>	C	С <sub>ε</sub>	Passing No. 200 (%)	U.S.C.S
•	CH-8	10.0-11.5	-	-	NP	0.004	0.18	0.38	107.2	24.4	13	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

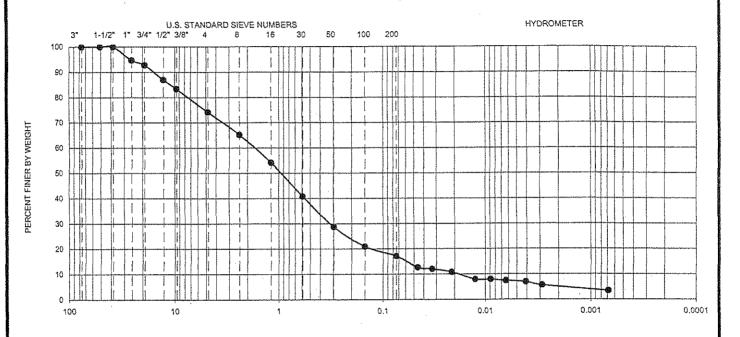
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EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
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GRAV	ÆL.		SAND		FINES			
Coarse Fine		Coarse	Medium	Fine	Silt	Clay		



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>50</sub>	C <sub>u</sub>	C.	Passing No. 200 (%)	U.S.C.S
€	CH-8	17.5-19.0	-	•	NP	0.019	0.33	1.80	95.0	3.2	17	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

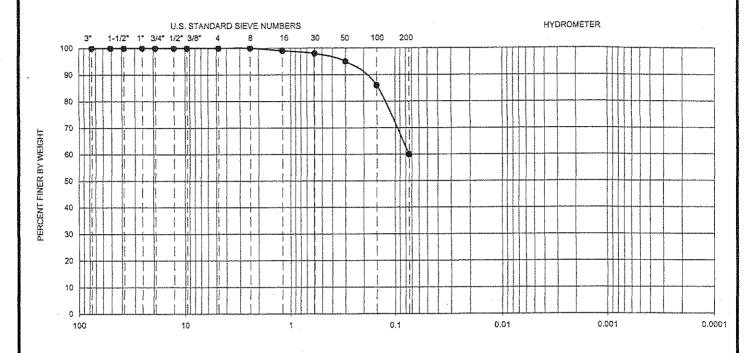
*Ninyo & Moore \_* 

## **GRADATION TEST RESULTS**

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PROJECT NO.	DATE
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GRAV	'EL		SAND		FINES				
Coarse Fine		Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limít	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C <sub>u</sub>	C₅	Passing No. 200 (%)	U.S.C.S
•	CH-9	5-6.5			<del></del>	***					60	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

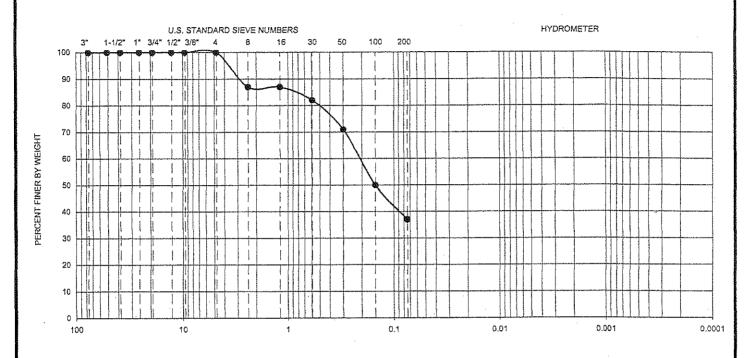
*Ninyo & Moore\_* 

# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV	ÆL		SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	C	Passing No. 200 (%)	U.S.C.S
•	CH-9	20-21.5	34	17	17		-	-			37	SC

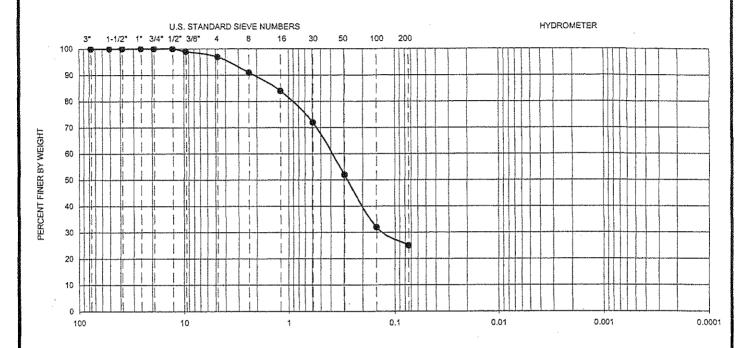
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV	/EL		SAND		FINES				
Coarse	Fine	Coarse	Medium-	Fine	Silt	Clay			



 Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	C.	Passing No. 200 (%)	U.S.C.S
•	CH-10	17.5-19	30	21	9	-		-			25	sc

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

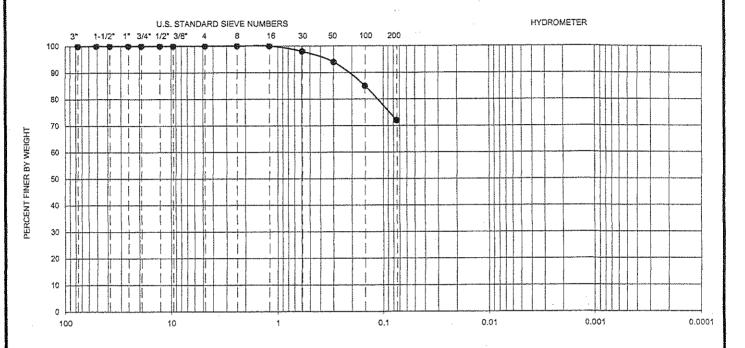


# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV	/EL		SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



	Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Сл	C₅	Passing No. 200 (%)	u.s.c.s
ĺ	0	CH-11	2.5-4	24	14	10						72	CL.

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

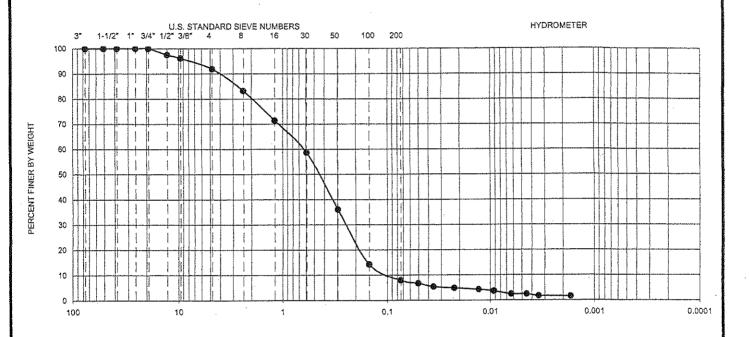
*Ninyo & Moore* ,

## **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV	'EL		SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	sitt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	رئ	င့	Passing No. 200 (%)	U.S.C.S
0	CH-11	15.5-17.0	-	<u></u>	NP	0.100	0.26	0.66	6.6	1.0	8	SW-SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

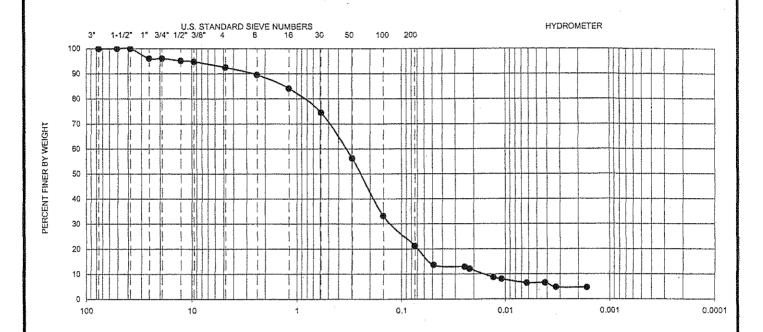


## **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAVEL SAND				FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt ,	Clay		



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C <sub>u</sub>	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
•	CH-12	7.5-9.0	-	•	NP	0.016	0.13	0.36	22.1	2.8	21	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

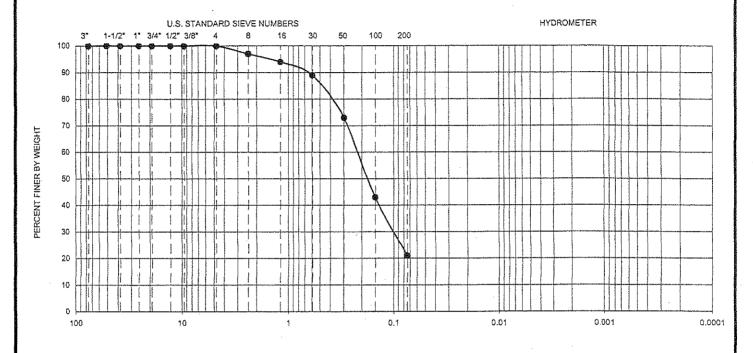
\_*Ninyo&*Moore\_

# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

	GRAV	'EL		SAND		FINES				
ĺ	Coarse Fine		Coarse		Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	Cc	Passing No. 200 (%)	U.S.C.S
•	CH-12	15-16.5	***								21	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

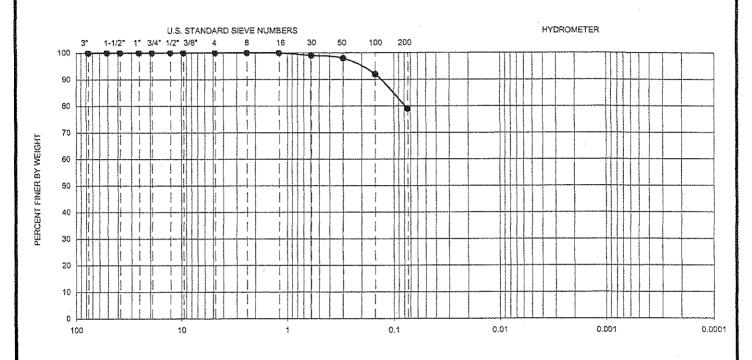
. *Ninyo &* Moore \_

# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV	GRAVEL SAND				FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



	Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cª	C°	Passing No. 200 (%)	U.S.C.S
٠	•	CH-13	5-6.5	30	28	2						79	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

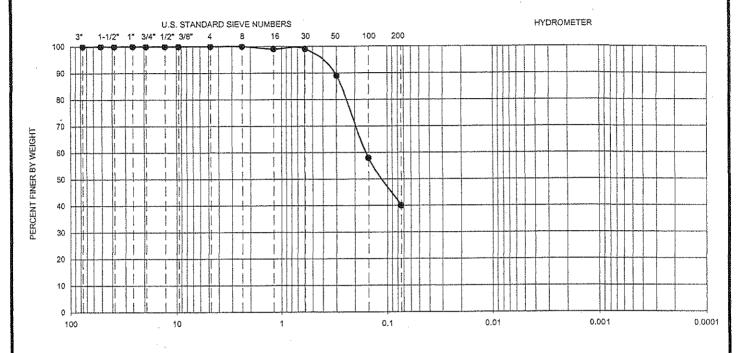
. *Ninyo &* Moore \_

## **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
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		<del>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</del>			, , , , , , , , , , , , , , , , , , ,				
GRAVEL			SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



 Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	Cc	Passing No. 200 (%)	U.S.C.S
 •	CH-13	15-16.5	25	22	3			_	-	-	40	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

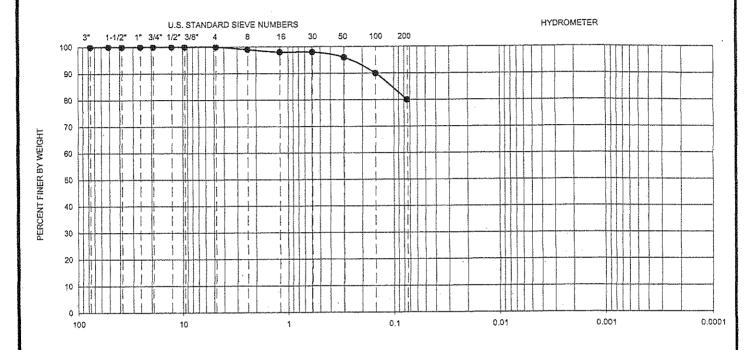
*Ninyo & M*oore \_

## **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
 600198001	01/02

GRAV	'EL		SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
8	CH-14	2.5-4	36	19	17						80	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

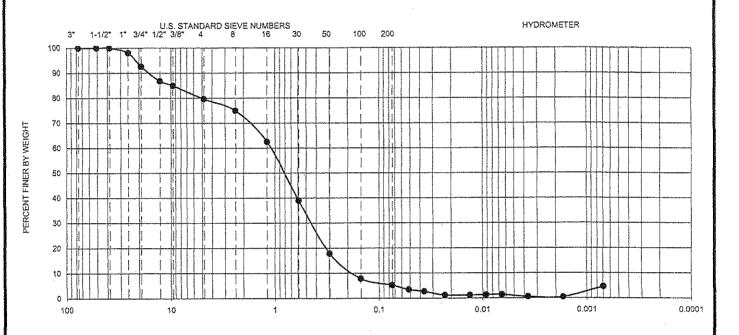
# . *Ninyo &* Moore \_

# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV	/EL		SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C.	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
6	CH-14	15.0-16.5	-		NP	0.182	0.47	1.12	6.1	1.1	5	SW-SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

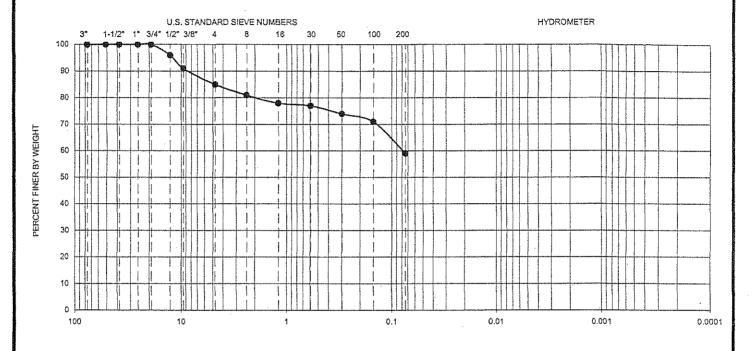


# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

	GRAVEL					FINES
Coa	Coarse Fine Coarse Medium		Fine	Silt	Clay	



 Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C <sub>u</sub>	Сс	Passing No. 200 (%)	u.s.c.s
 •	CH-15	17.5-19	28	23	5		-	-			59	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

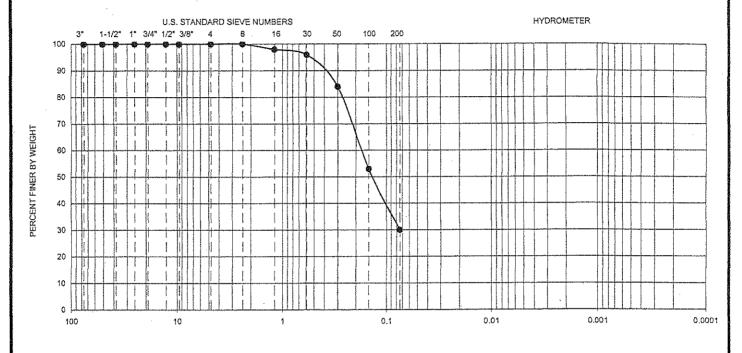
*Ninyo* « Moore \_

# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAVEL			SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt .	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C.	C <sub>c</sub>	Passing No. 200 (%)	u.s.c.s
	CH-16	15-16.5	as an								30	SM+CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

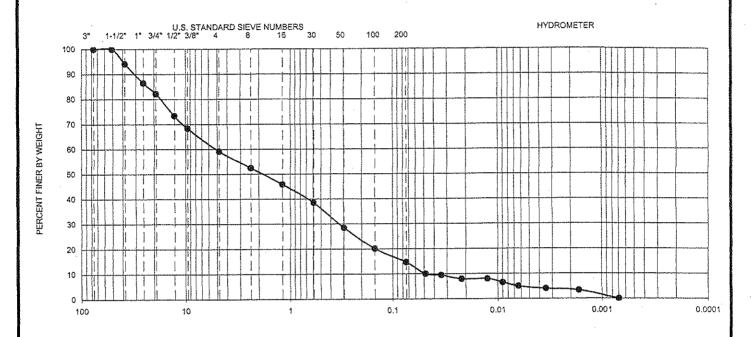
. *Ninyo & M*oore \_

# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV	/EL		SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C <sub>u</sub>	C <sub>e</sub>	Passing No. 200 (%)	u.s.c.s
9	CH-16	20.0-21.5	-	<b>u.</b>	NP	0.048	0.35	5.19	108.1	0.5	15	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

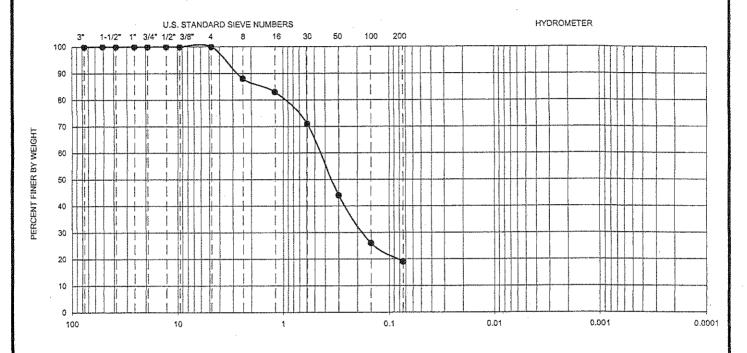
. *Ninyo &* Moore \_

## **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAVEL SAND					FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	Cc	Passing No. 200 (%)	U.S.C.S
•	CH-16	32.5-34	~=								19	SM+CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

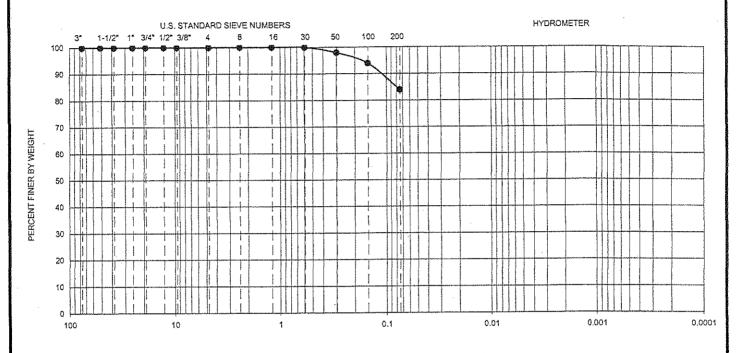


# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

r					·····	I		
Į	GRAVEL		SAND		FINES			
Ì	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
0	CH-17	7.5-9	40	23	17						84	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

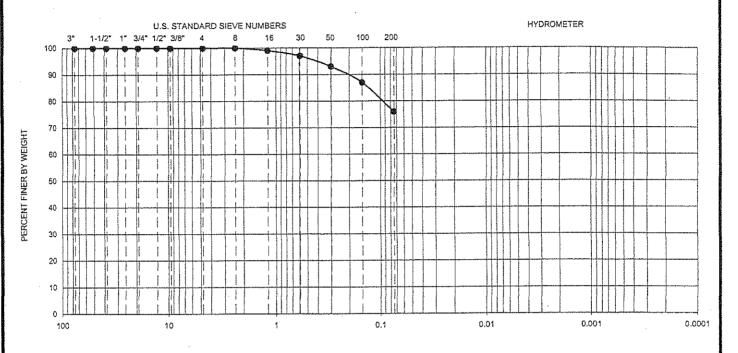


# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

Γ	CDAV	/m1		SAND	FINES				
L	GRAV	'CL	SANU				1 1174-0		
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
0	CH-17	22.5-24	29	19	10					·	76	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

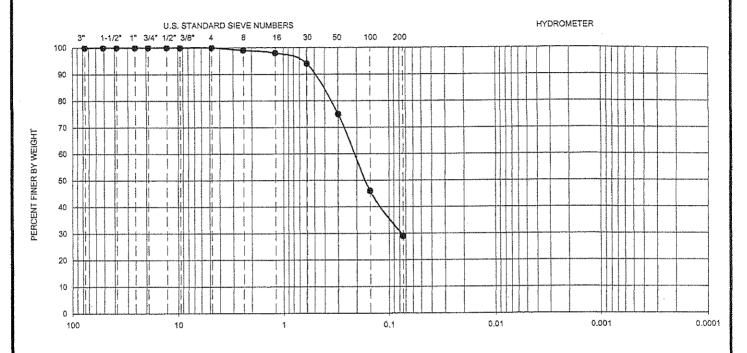
# . *Ninyo* « Moore .

## **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

1	GRAV	GRAVEL SAND				FINES				
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	Cc	Passing No. 200 (%)	U.S.C.S
٠	CH-18	10-11.5			***						29	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

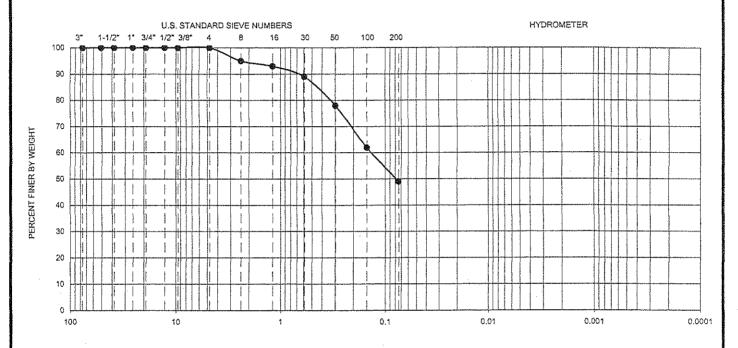


# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV	ÆL		SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
6	CH-19	2.5-4		:	*-			-			49	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

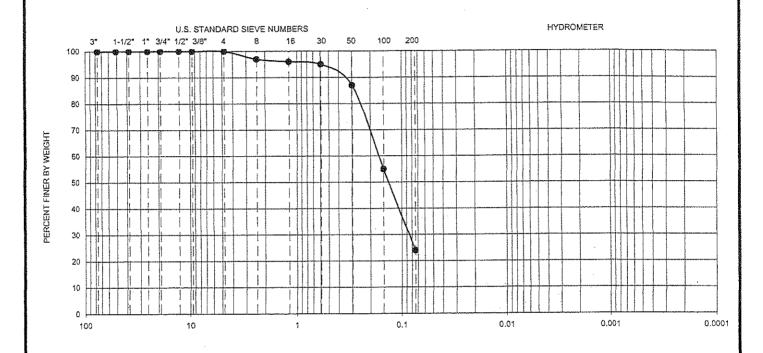
\_*Ninyo* & Moore \_

## **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001 `	01/02

ļ	GRAV	'EL		SAND		FINES				
-	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub> .	D <sub>30</sub>	D <sub>60</sub>	Cu	C <sub>c</sub>	Passing No. 200 (%)	Ų.S.C.S
9	CH-19	22.5-24					_				24	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

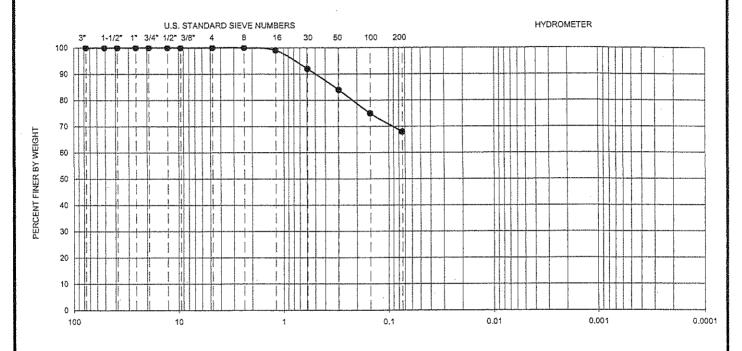
. *Ninyo* & Moore \_

## **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV	'EL		SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C,	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
9	CH-20	10-11.5		_						N-20-	68	ML.

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

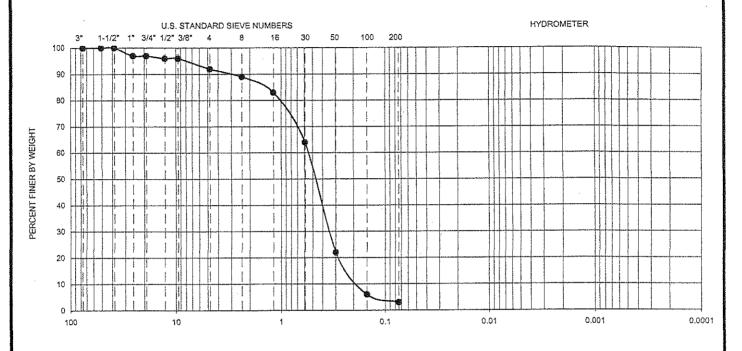
. *Ninyo & M*oore .

## **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

1	GRAV	ÆL.		SAND		FINES			
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		



Symt	ool	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C <sub>u</sub>	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
•		CH-20	25-26.5									3	SP

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

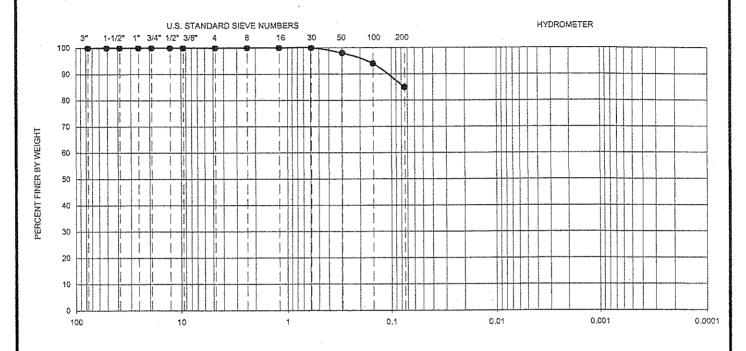
. *Ninyo & M*oore \_

# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV	EL.		SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C <sub>u</sub>	C <sub>°</sub>	Passing No. 200 (%)	U.S.C.S
•	CH-21	7.5-9	pusis	_	daste						85	ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

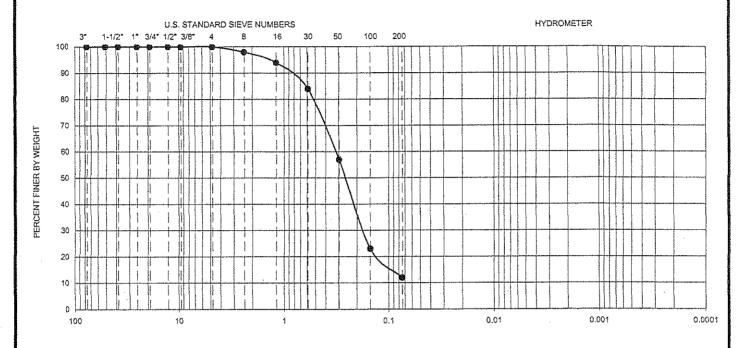


# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV	/EL		SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



 Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
•	CH-21	22.5-24					No-THE	_		<del></del>	12	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

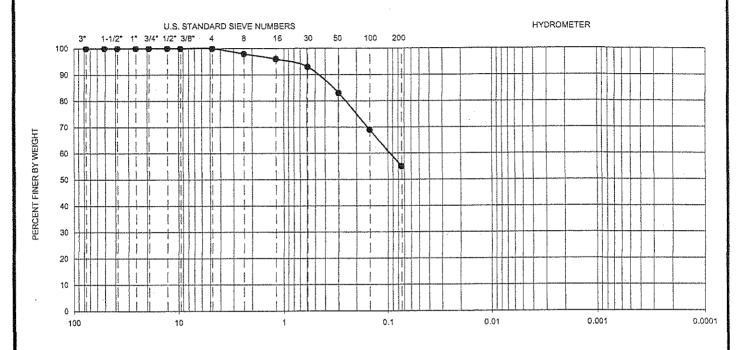
*Ninyo & M*oore \_

# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV	/EL		SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C <sub>u</sub>	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
. 8	CH-22	15-16.5	44	18	26						55	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

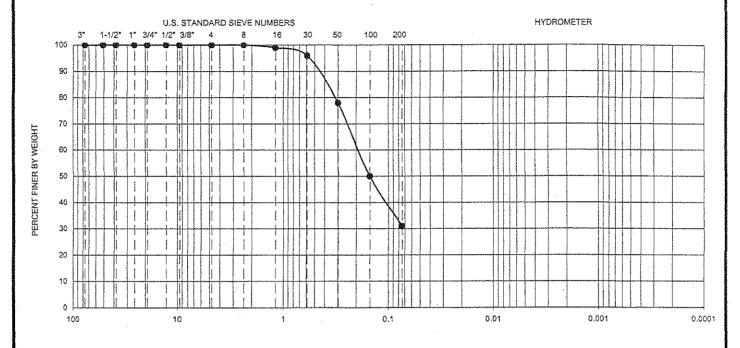
. *Minyo & Moore \_* 

# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV			SAND		FINES			
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C <sub>u</sub>	C <sub>e</sub>	Passing No. 200 (%)	U.S.C.S
8	CH-22	25-26.5				• <del>•</del>		-			31	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

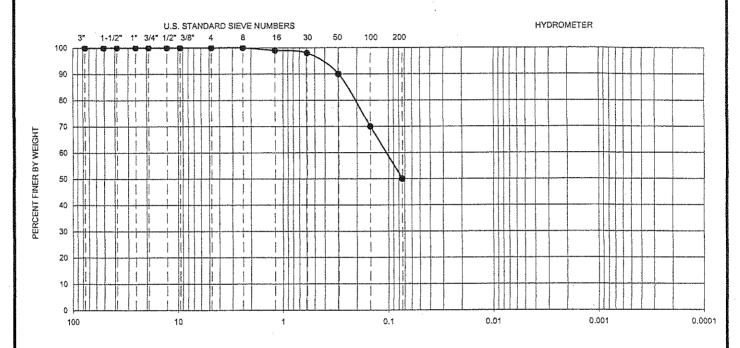
. *Ninyo & M*oore \_

# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV	/EL		SAND		FINES			
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	Cc	Passing No. 200 (%)	U.S.C.S
•	CH-23	7.5-9	21	16	5						50	CL-ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

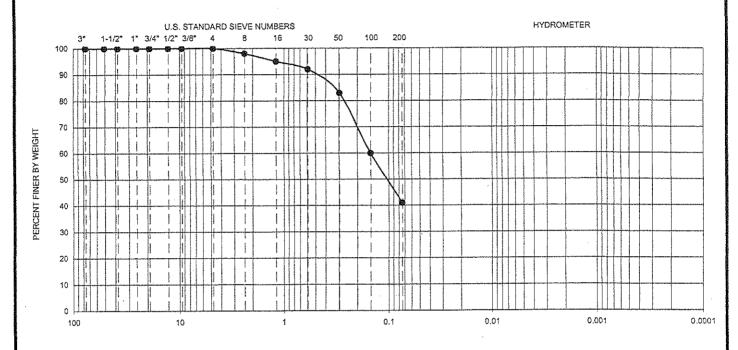
# . *Ninyo & M*oore \_

# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV	/EL		\$AND	-	FINES				
Coarse	Fine	Coarse	Medium	Fine	Sift	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	C <sub>c</sub>	Passing No. 200 . (%)	U.S.C.S
•	CH-24	17.5-19									41	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

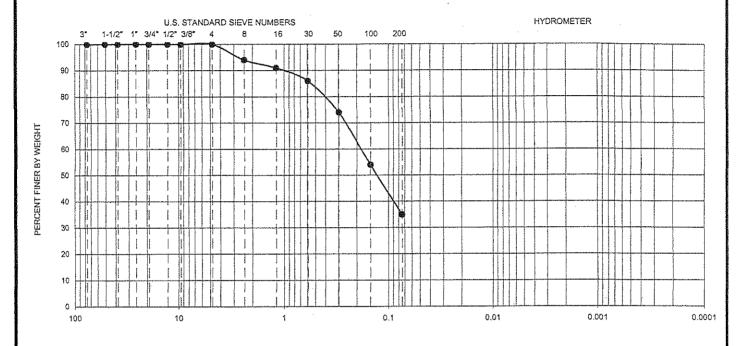
*Ninyo & Moore \_* 

## **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV	ÆL		SAND		FINES			
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	Cu	C <sub>E</sub>	Passing No. 200 (%)	U.S.C.S
•	CH-24	22.5-24				***				_	35	SM

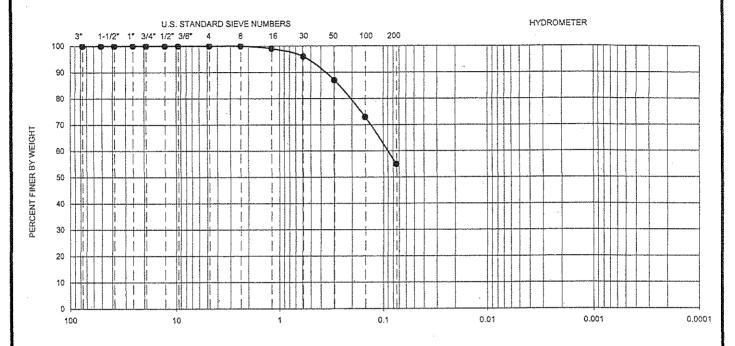
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

## **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

ļ	GRAV	/EL		SAND		FINES				
	Coarse	Fine	Coarse	Medium	Fine	Silt	. Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>50</sub>	Cu	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
•	CH-25	12.5-14	21	16	- 5		-		-		55	CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

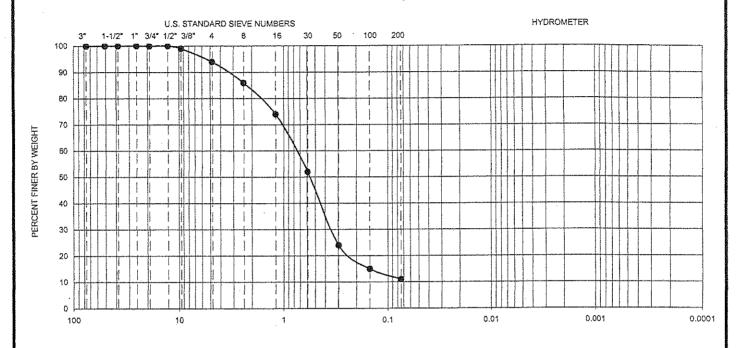
*Ninyo & Moore \_* 

# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAVEL			SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	ĺ		



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C <sub>u</sub>	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
•	CH-25	20-21.5							-		11	SM

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

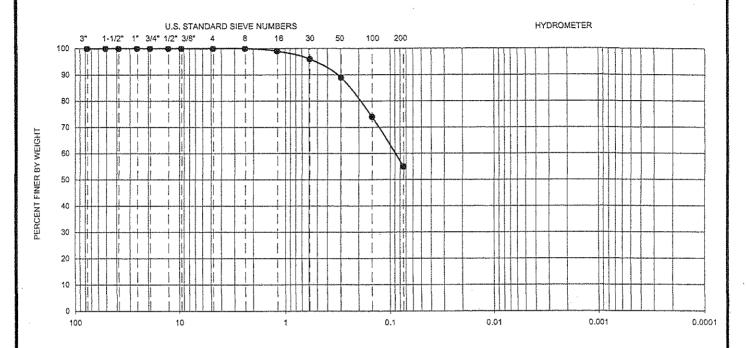


# **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV			SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C <sub>u</sub>	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
8	CH-26	2.5-4	26	21	5						55	CL-ML

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

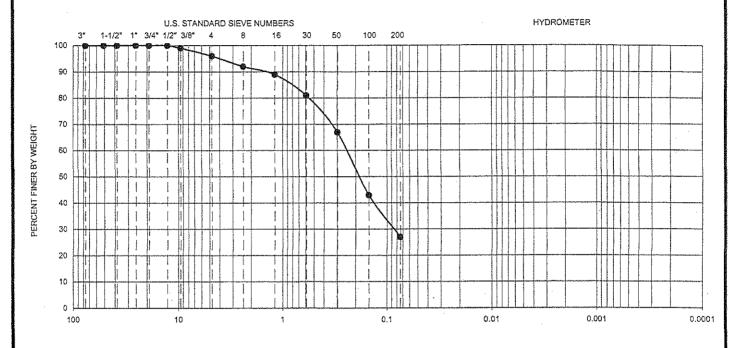
. *Ninyo* « Moore \_

## **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

GRAV	/EL		SAND		FINES				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay			



Symbol	Hole No.	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	D <sub>10</sub>	D <sub>30</sub>	D <sub>60</sub>	C <sub>u</sub>	C <sub>c</sub>	Passing No. 200 (%)	U.S.C.S
8	CH-26	20-21.5	m =-	-				<b>+</b>		mm.	27	SM+CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422-63

. *Ninyo &* Moore \_

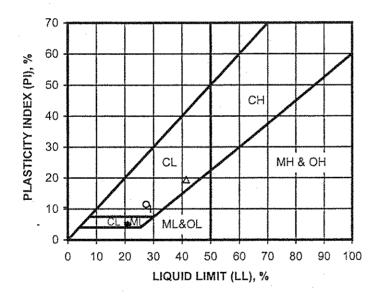
## **GRADATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02
	Samuel Committee of the

SYMBOL.	LOCATION	DEPTH (FT)	LL (%)	PL (%)	PI (%)	U.S.C.S. CLASSIFICATION (Minus No. 40 Sieve Fraction)	U.S.C.S. (Entire Sample)
	CH-1	7.5-9	**	-	<u></u>	NP	ML
<b>29</b>	CH-1	20.0-21.5	<b></b> .	-	-	NP	SM
. �	CH-2	5-6.5	21	16	5	CL-ML	CL
0	CH-2	15-16.5	28	16	12	CL	SM
	CH-3	15-16.5	<b>.</b>	•		NP	SM
Δ	CH-4	7.5-9	42	22	20	CL	CL
×	CH-4	17.5-19.0				NP	SP-SM
+	CH-5	5-6.5	29	19	10	CL ·	CL

NP - Indicates non-plastic



*Ninyo & Moore* 

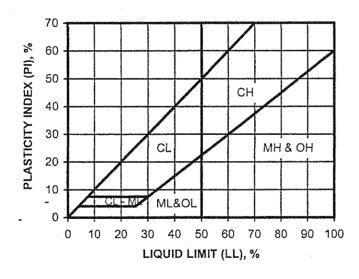
## ATTERBERG LIMITS TEST RESULTS

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

garage and	PROJECT NO.	DATE
	600198001	01/02

SYMBOL	LOCATION	DEPTH (FT)	LL (%)	PL (%)	PI (%)	U.S.C.S. CLASSIFICATION (Minus No. 40 Sieve Fraction)	U.S.C.S. (Entire Sample)
	CH-5	15-16.5	<b>***</b>	-	-	NP	ML
. 1885	CH-6	7.5-9	. <b></b>	<b></b>	<b>.</b>	NP	ML
•	CH-6	17.5-19	<del>, .</del> .		-	NP	SM
0	CH∗7	5-6.5	<b>-</b>	•	<u>.</u>	NP	ML
0	CH-7	15-16.5	••		~	NP	SP
Δ	CH-8	10-11.5	<u></u>	•	· ₩	NP	SM
х	CH-8	17.5-19.0	-	-		NP	SM
+	CH-9	5-6.5	<u>.</u>	-	••••••••••••••••••••••••••••••••••••••	NP	ML

NP - Indicates non-plastic



*Ninyo* & Moore

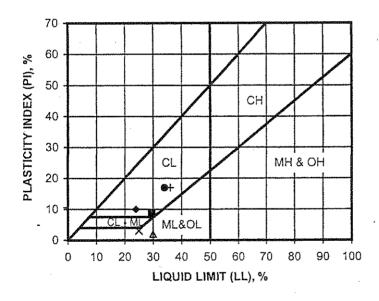
## ATTERBERG LIMITS TEST RESULTS

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

SYMBOL	LOCATION	DEPTH (FT)	LL (%)	PL (%)	PI (%)	U.S.C.S. CLASSIFICATION (Minus No. 40 Sieve Fraction)	U.S.C.S. (Entire Sample)
. •	CH-9	20-21.5	34	17	17	CL	SC
	CH-10	17.5-19	30	21	9	CL	sc
•	CH-11	2.5-4.0	24	14	10	CL	CL <sub>.</sub>
0	CH-11	15.5-17	· ••		<b>.</b>	NP	SW-SM
	CH-12	15-16.5	-	-		NP	SM
Δ	CH-13	5-6.5	30	28	2	ML	ML
×	CH-13	15-16.5	25	22	3	ML	SM
+	CH-14	2.5-4	36	19	17	CL	CL
	THE PROPERTY AND ADDRESS OF THE PROPERTY ADDRESS OF THE PROPERTY AND ADDRESS OF THE PROPERTY ADDRESS OF TH	- Control of the Cont					ALEXANDER OF THE PROPERTY OF T

NP - Indicates non-plastic



*Ninyo* & Moore

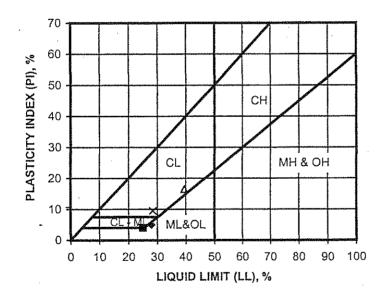
# ATTERBERG LIMITS TEST RESULTS

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

SYMBOL	LOCATION	DEPTH (FT)	LL (%)	PL (%)	Pl (%)	U.S.C.S. CLASSIFICATION (Minus No. 40 Sieve Fraction)	U.S.C.S. (Entire Sample)
. 6	CH-14	15.0-16.5	-	<b>-</b>	•••	NP	SW-SM
Ø	CH-15	7.5-9	25	21	4	CL-ML	CL-ML
. 🍫	CH-15	17.5-19	28	23	5	ML	ML
0	CH-16	15-16.5	-	-	-	NP	SM+CL
D	CH-16	32.5-34	-	-	<u>.</u>	NP	SM+CL
Δ	CH-17	7.5-9	40	23	17	CL	CL
x	CH-17	22.5-24	29	19	10	CL	CL
+	CH-18	10-11.5	<u>.</u>	-	u.	NP	SM+CL
							TORRANDO MARIA CARA CARA CARA CARA CARA CARA CARA

NP - Indicates non-plastic



*Ninyo* & Moore

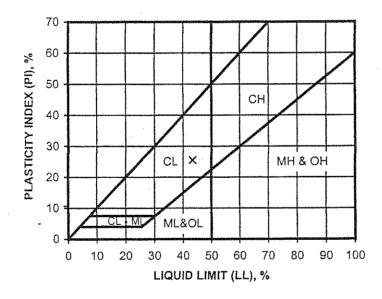
## ATTERBERG LIMITS TEST RESULTS

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

	SYMBOL	LOCATION	DEPTH (FT)	LL (%)	PL (%)	PI (%)	U.S.C.S. CLASSIFICATION (Minus No. 40 Sieve Fraction)	U.S.C.S. (Entire Sample)
	· 6	CH-19	2.5-4	<b>-</b> ·	-	••	NP	SM
		CH-19	22.5-24		•	-	NP	SM
	•	CH-20	10-11.5	-	-	•	NP	ML
	0	CH-20	25-26.5	<b></b>	<u>-</u>	-	NP	SP
		CH-21	7.5-9	<b></b>	-	.' <del>-</del>	NP	ML
	Δ	CH-21	22.5-24	<b>-</b>	-	-	NP	SM
	X	CH-22	15-16.5	44	18	26	CL	CL
	+	CH-22	25-26.5	**	-	<u></u>	NP	SM
Ì							The state of the s	

NP - Indicates non-plastic



*Ninyo & Moore* 

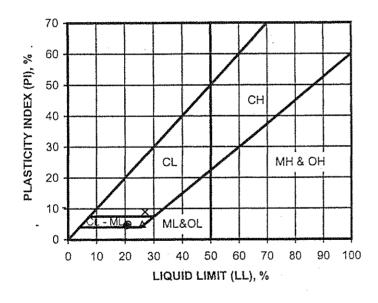
## ATTERBERG LIMITS TEST RESULTS

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

SYMBOL	LOCATION	DEPTH (FT)	LL (%)	PL (%)	PI (%)	U.S.C.S. CLASSIFICATION (Minus No. 40 Sieve Fraction)	U.S.C.S. (Entire Sample)
•	CH-23	7.5-9	21	16	5	CL-ML	CL-ML
<b>81</b> -	CH-24	17.5-19	<b>1-1</b>		-	NP	SM
•	CH-24	22.5-24	-	-	<b></b>	NP	SM.
0	CH-25	12.5-14	21	16	5	CL-ML	CL
	CH-25	20-21.5	-	-	-	NP	SM
Δ	CH-26	2.5-4	26	21	5	CL-ML	CL
. x	CH-26	20-21.5	27	18	9	CL	SM+CL
		14 TO THE REAL PROPERTY AND THE REAL PROPERT					

NP - Indicates non-plastic



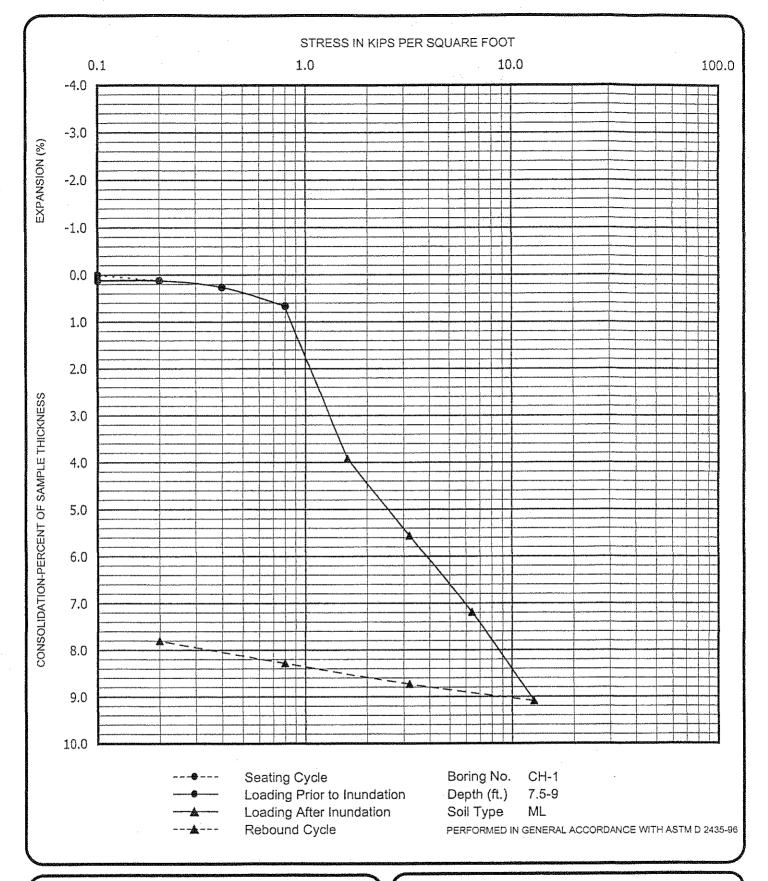
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318-98

*Ninyo* & Moore

# ATTERBERG LIMITS TEST RESULTS

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

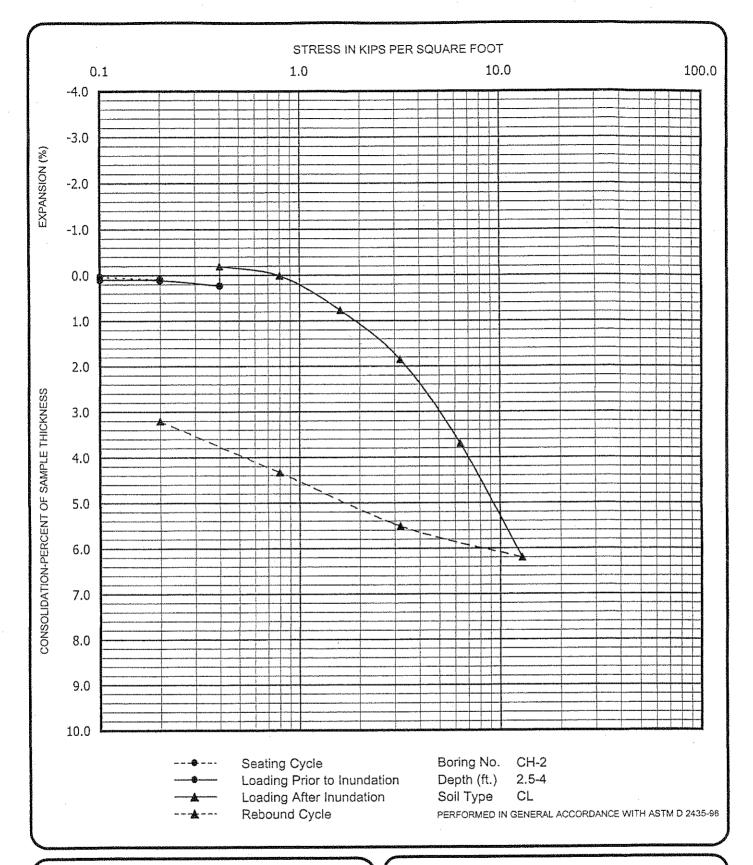


# *Ninyo & M*oore\_

# **CONSOLIDATION TEST RESULTS**

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

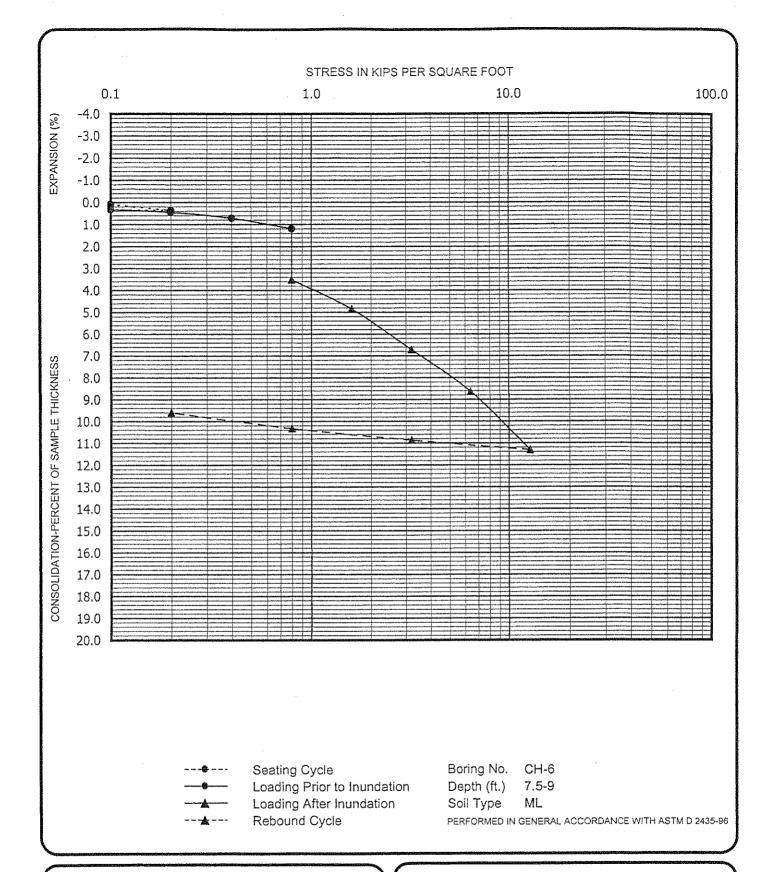


# *Ninyo* « Moore \_

# **CONSOLIDATION TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

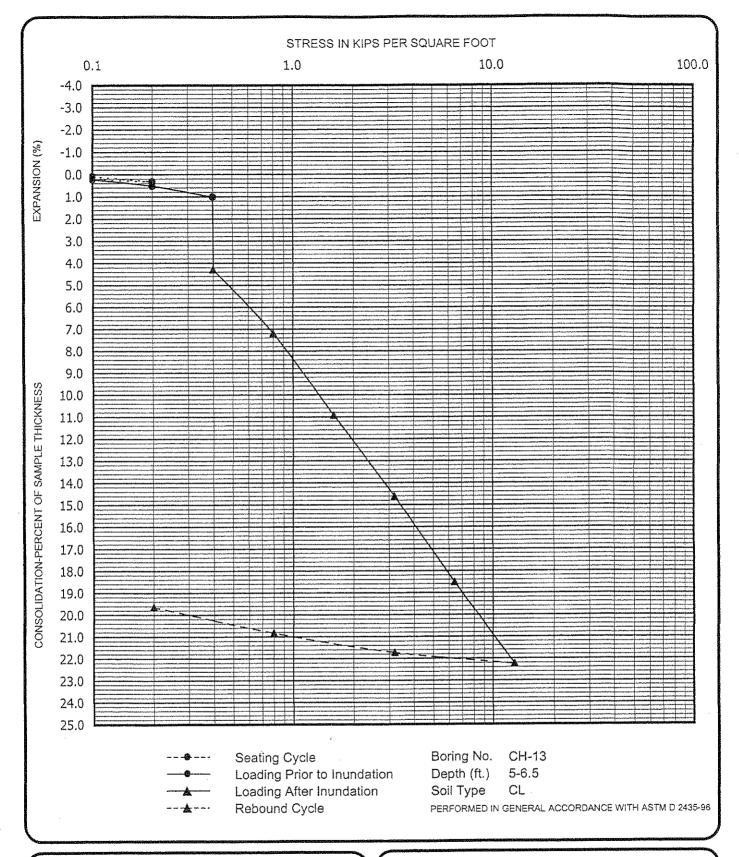


# *Ninyo∝* Moore\_

### **CONSOLIDATION TEST RESULTS**

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

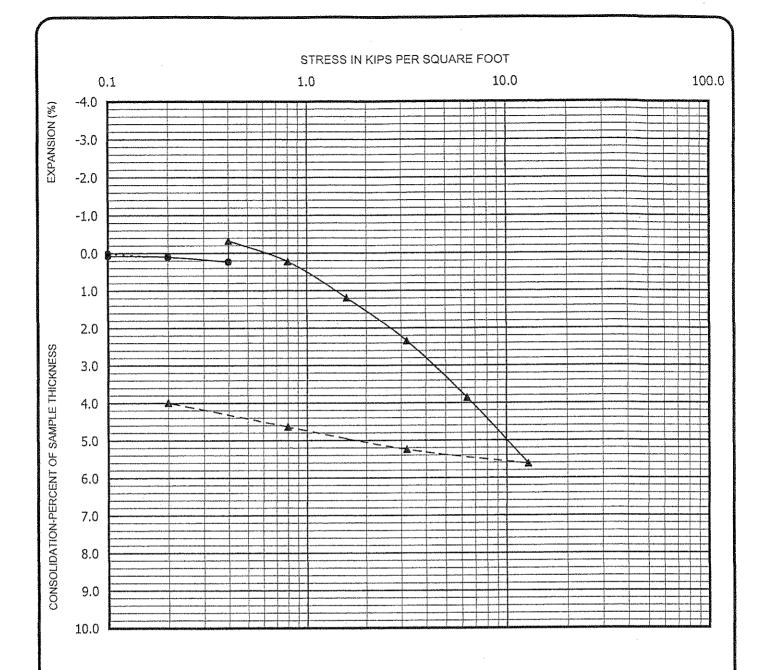


# *Ninyo & Moore*

# **CONSOLIDATION TEST RESULTS**

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	
600198001	01/02	



Seating Cycle
Loading Prior to Inundation
Loading After Inundation
Rebound Cycle

Boring No. CH-16 Depth (ft.) 2.5-4 Soil Type CL

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2435-96

# *Ninyo & M*oore\_

# **CONSOLIDATION TEST RESULTS**

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE	
600198001	01/02	

### **EXPANSION INDEX TEST RESULTS**

SAMPLE LOCATION	SAMPLE DEPTH (FT)	INITIAL MOISTURE (%)	COMPACTED DRY DENSITY (PCF)	FINAL MOISTURE (%)	VOLUMETRIC SWELL (IN)	EXPANSION INDEX	EXPANSION POTENTIAL
CH-11	0-2	11.1	111.1	17.5	0.0158	16	Very Low
CH-21	12-15	11.0	108.8	18.7	0.0058	6	Very Low
CH-23	0-2	10.2	106.9	18.9	0.0171	17	Very Low
CH-25	12-15	7.8	113.0	14.4	0.0000	0	Very Low
		·					
Annual services							
							Anna anna anna anna anna anna anna anna

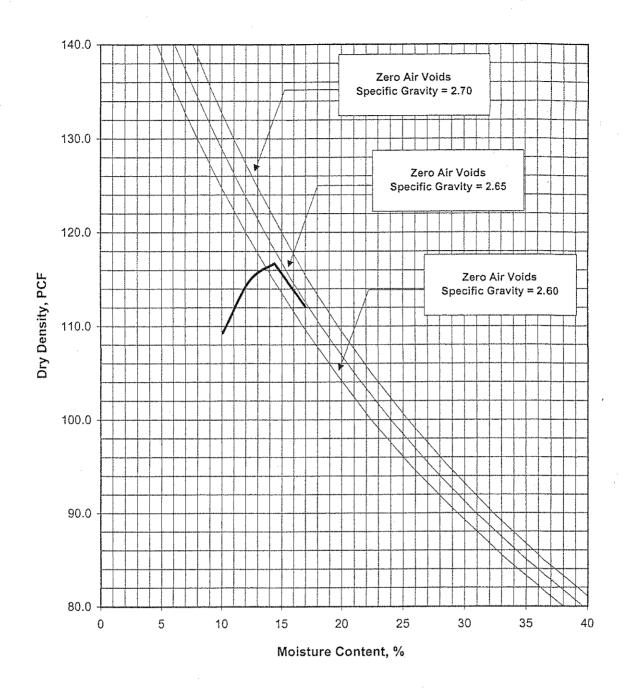
PERFORMED IN GENERAL ACCORDANCE WITH UBC STANDARD 18-2



## **EXPANSION INDEX TEST RESULTS**

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02



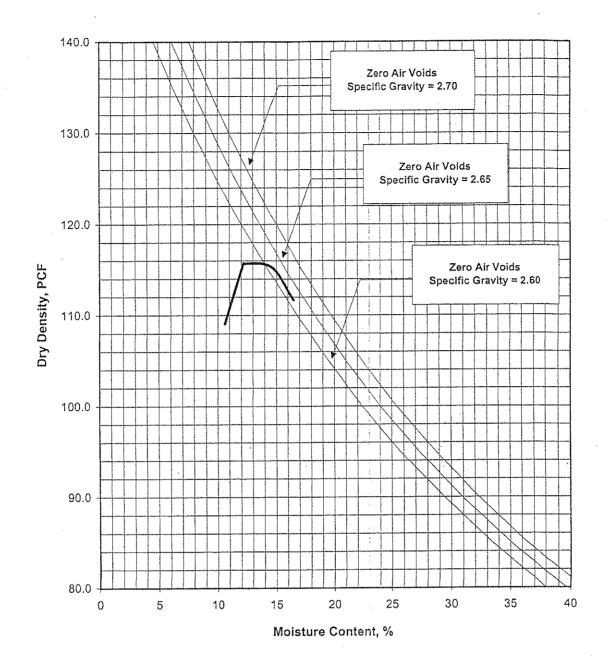
SAMPLE	DEPTH	SOIL DESCRIPTION	MAXIMUM DENSITY	OPTIMUM MOISTURE
LOCATION	(FT)		(PCF)	CONTENT (%)
CH-11	0-2	Sandy Clay	116.7	14.4



# MAXIMUM DENSITY TEST RESULTS

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02



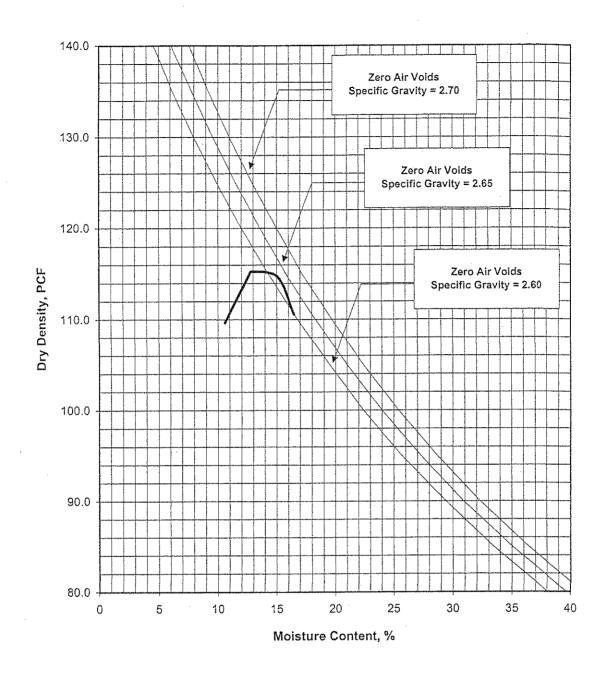
SAMPLE LOCATION	DEPTH (FT)	SOIL DESCRIPTION	MAXIMUM DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)
CH-21	12-15	Sandy Clay - Silty Sand	115.7	12.2



# MAXIMUM DENSITY TEST RESULTS

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02



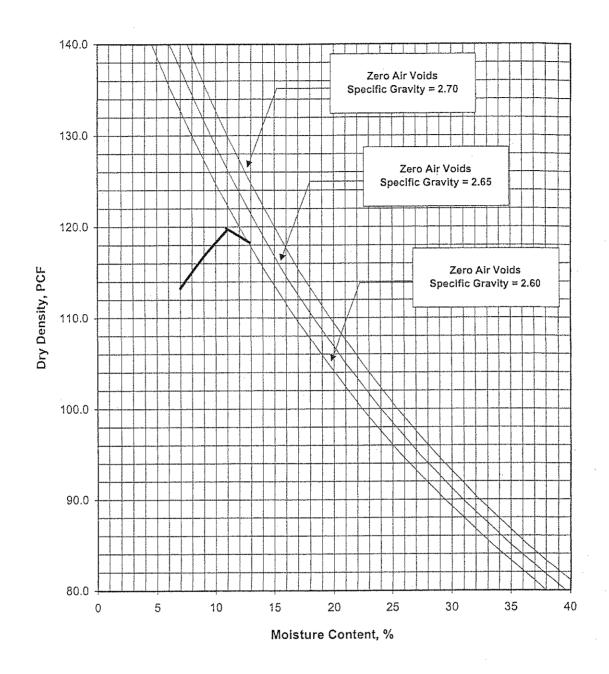
SAMPLE LOCATION	DEPTH (FT)	SOIL DESCRIPTION	MAXIMUM DENSITY (PCF)	OPTIMUM MOISTURE CONTENT (%)
CH-23	0-2	Silty Clay	115.3	12.8



# MAXIMUM DENSITY TEST RESULTS

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO	D. DATE
600198001	01/02



SAMPLE	DEPTH	SOIL DESCRIPTION	MAXIMUM DENSITY	OPTIMUM MOISTURE
LOCATION	(FT)		(PCF)	CONTENT (%)
CH-25	12-15	Silty Clay	119.7	11.0



### MAXIMUM DENSITY TEST RESULTS

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

### **CORROSIVITY TEST RESULTS**

SAMPLE LOCATION	SAMPLE DEPTH (FT)	* Hq	RESISTIVITY * (ohm-cm)	WATER-SOLUBLE SULFATE CONTENT IN SOIL ** (%)	CHLORIDE CONTENT *** (ppm)
CH-11	0-2	7.6	508	0.0025	160
CH-21	12-15	8.4	1,320	0.0004	10

- \* PERFORMED IN GENERAL ACCORDANCE WITH ARIZONA TEST METHOD 236b
- \*\* PERFORMED IN GENERAL ACCORDANCE WITH ARIZONA TEST METHOD 733
- \*\*\* PERFORMED IN GENERAL ACCORDANCE WITH ARIZONA TEST METHOD 722



### **CORROSIVITY TEST RESULTS**

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

### PERMEABILITY TEST RESULTS

SAMPLE LOCATION	SAMPLE DEPTH (FT)	INITIAL MOISTURE (%)	FINAL MOISTURE (%)	DRY DENSITY (PCF)	RANGE IN HEAD (cm)	AVERAGE PERMEABILITY (cm/sec)
CH-1	20.0-21.5	9.7	20.6	101.1	30.0-40.0	8.5 x 10 <sup>-5</sup>
CH-4	17.5-19.0	2.3	12.5	109.7	2.0-12.0	1.4 x 10 <sup>-3</sup>
CH-7	15.0-16.5	0.1	10.4	111.2	2.6 - 12.4	1.3 x 10 <sup>-2</sup>
CH-8	10.0-11.5	2.8	18.2	103.3	2.0 - 12.4	9.8 x 10 <sup>-4</sup>
CH-8	17.5-19.0	2.8	10.9	104.4	2.0 - 2.7	2.8 x 10 <sup>-4</sup>
CH-11	15.5-17.0	4.4	17.8	102.6	2.5 - 11.4	2.8 x 10 <sup>-3</sup>
CH-12	7.5-9.0	3.4	16.5	96.7	2.0 - 12.3	7.8 x 10 <sup>-4</sup>
CH-14	15.0 -16.5	1.3	16.1	107.7	2.4 - 12.3	1.4 x 10 <sup>-2</sup>
CH-16	20.0-21.5	3.8	N.M.	107.3	2.4 - 11.9	2.9 x 10 <sup>-4</sup>

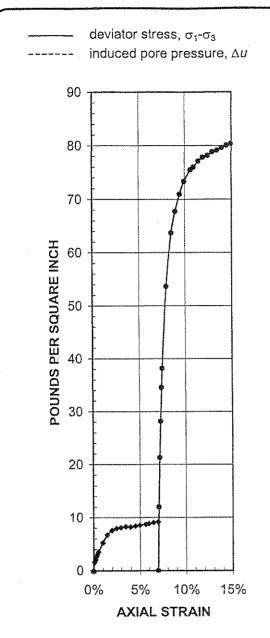
PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 2434-68

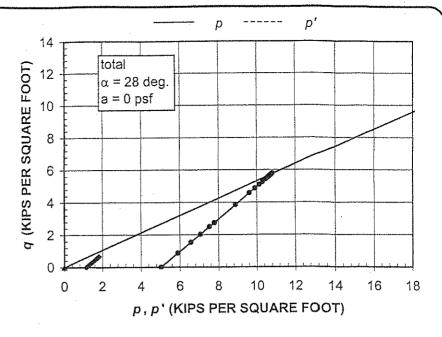


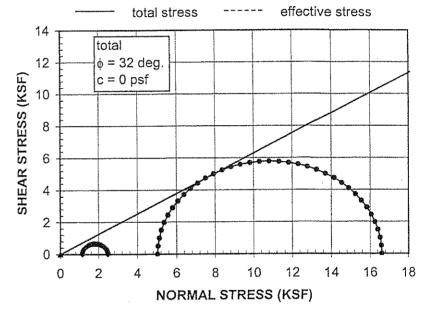
### PERMEABILITY TEST RESULTS

EAST MARICOPA FLOODWAY
CHANDLER HEIGHTS DETENTION BASIN
MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02







Sym.	Description	Soil Type	Sample Location	Sample Depth (ft.)	Initial Moisture (%)	Initial Dry Density (pcf)	Final Degree Saturation	Confining Stress (ksf)	Rate of Strain (%/min)
*	Silty Sand	.SM	CH-1	20.0-21.5	9.7%	101.1	83%	1.15	0.9%
•	Silty Sand	SM	CH-1	20.0-21.5	9.7%	101.1	83%	5.04	1.0%
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*Ninyo &* Moore\_

**UU TRIAXIAL COMPRESSION RESULTS** 

EAST MARICOPA FLOODWAY CHANDLER HEIGHTS DETENTION BASIN MARICOPA COUNTY, ARIZONA

PROJECT NO.	DATE
600198001	01/02

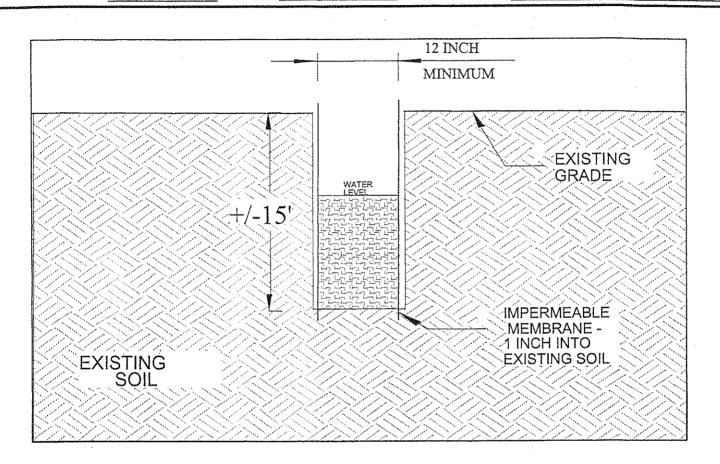
#### APPENDIX C

### PERCOLATION TEST RESULTS



PROJECT: Rittenhouse Detention Basin PROJECT NO.: 600198001

TECHNICIAN: MDE DATE: 07/19/01 LOCATION: PT-1 (Near RH-14)



START TIME (Hr:Min)	ENDING TIME (Hr:Min)	ELAPSED TIME (Hr:Min)	INITIAL READING (Feet)	FINAL READING (Feet)	CHANGE IN WATER LEVEL (Feet)	PERCOLATION RATE*
11:00	11:28	0:28	0.35	0.36	0.01	0.02
11:28	11:47	0:19	0.36	0.40	0.04	0.13
11:47	12:11	0:24	0.40	0.44	0.04	0.10
12:11	12:30	0:19	0.44	0.46	0.02	0.06
12:30	12:50	0:20	0.46	0.49	0.03	0.09

<sup>\*</sup> Note: Percolation Rate is reported in Cubic Feet per Hour per Square Foot of percolation area.

AVERAGE PERCOLATION RATE FOR LAST THREE READINGS 0.08 FT3/HOUR/FT2



PROJECT NO .: 600198001 Rittenhouse Detention Basin PROJECT:

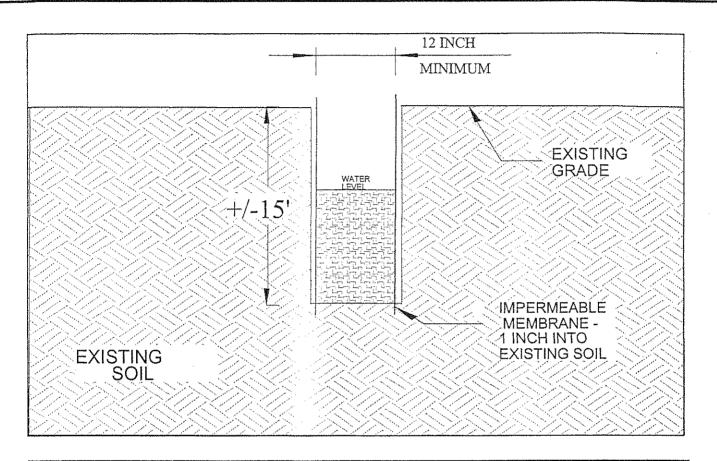
TECHNICIAN:

MDE

DATE:

07/19/01

LOCATION: PT-2 (Near RH-15)



START TIME (Hr:Min)	ENDING TIME (Hr:Min)	ELAPSED TIME (Hr:Min)	INITIAL READING (Feet)	FINAL READING (Feet)	CHANGE IN WATER LEVEL (Feet)	PERCOLATION RATE*
10:48	11:24	0:36	0.90	4.40	3.50	5.83
11:24	11:43	0:19	4.40	5.40	1.00	3.16
11:43	12:00	0:17	5.40	6.11	0.71	2.51
12:00	12:25	0:25	6.11	6.99	0.88	2.11
12:25	12:45	0:20	6.99	7.54	0.55	1.65

<sup>\*</sup> Note: Percolation Rate is reported in Cubic Feet per Hour per Square Foot of percolation area.

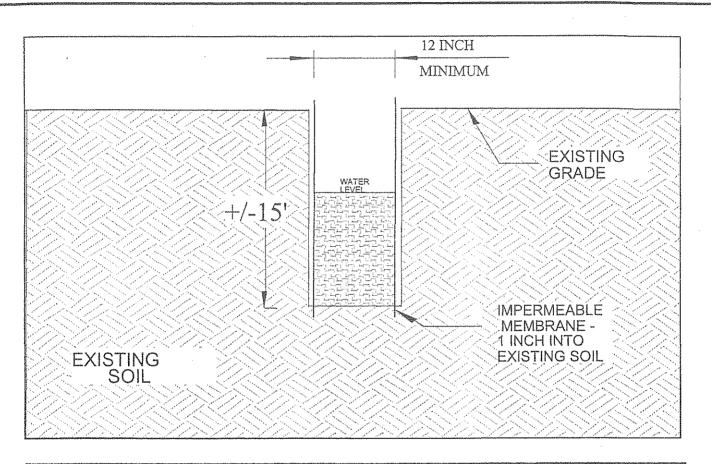
AVERAGE PERCOLATION RATE FOR LAST THREE READINGS

2.09



PROJECT: Rittenhouse Detention Basin PROJECT NO.: 600198001

TECHNICIAN: MDE DATE: 07/19/01 LOCATION: PT-3 (Near RH-16)



START TIME (Hr.Min)	ENDING TIME (Hr:Min)	ELAPSED TIME (Hr:Min)	INITIAL READING (Feet)	FINAL READING (Feet)	CHANGE IN WATER LEVEL (Feet)	PERCOLATION RATE*
10:36	11:17	0:41	0.40	1.20	0.80	1.17
11:17	11:36	0:19	1.20	1.52	0.32	1.01
11:36	11:54	0:18	1.52	1.81	0.29	0.97
11:54	12:19	0:25	1.81	2.20	0.39	0.94
12:19	12:39	0:20	2.20	2.45	0.25	0.75

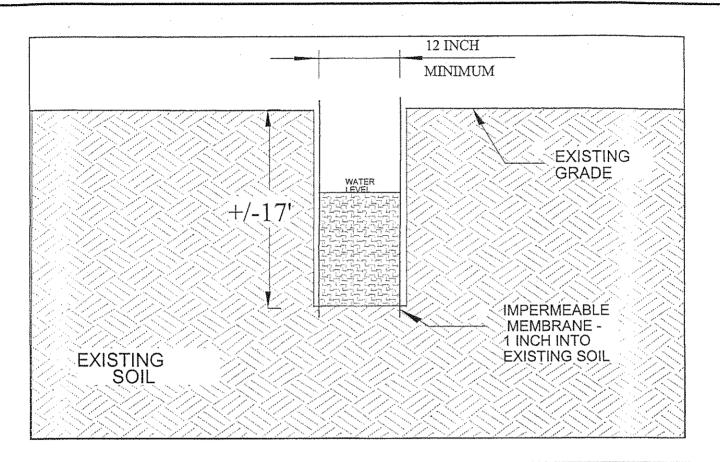
\* Note: Percolation Rate is reported in Cubic Feet per Hour per Square Foot of percolation area.

AVERAGE PERCOLATION RATE FOR LAST THREE READINGS 0.88 FT<sup>3</sup>/HOUR/FT<sup>2</sup>



PROJECT: Rittenhouse Detention Basin PROJECT NO.: 600198001

TECHNICIAN: MDE DATE: 07/19/01 LOCATION: PT-4 (Near RH-17)



START TIME (Hr:Min)	ENDING TIME (Hr.Min)	ELAPSED TIME (Hr:Min)	INITIAL READING (Feet)	FINAL READING (Feet)	CHANGE IN WATER LEVEL (Feet)	PERCOLATION: RATE*
10:27	11:12	0:45	3.10	4.40	1.30	1.73
11:12	11:39	0:27	4.40	4.85	0.45	1.00
11:39	11:51	0:12	4.85	5.22	0.37	1.85
11:51	12:15	0:24	5.22	5.78	0.56	1.40
12:15	12:35	0:20	5.78	6.01	0.23	0.69

<sup>\*</sup> Note: Percolation Rate is reported in Cubic Feet per Hour per Square Foot of percolation area.

AVERAGE PERCOLATION RATE FOR LAST THREE READINGS 1.31 FT<sup>3</sup>/HOUR/FT<sup>2</sup>



PROJECT: Chandler Heights Detention Basin

PROJECT NO.:

600198001

TECHNICIAN:

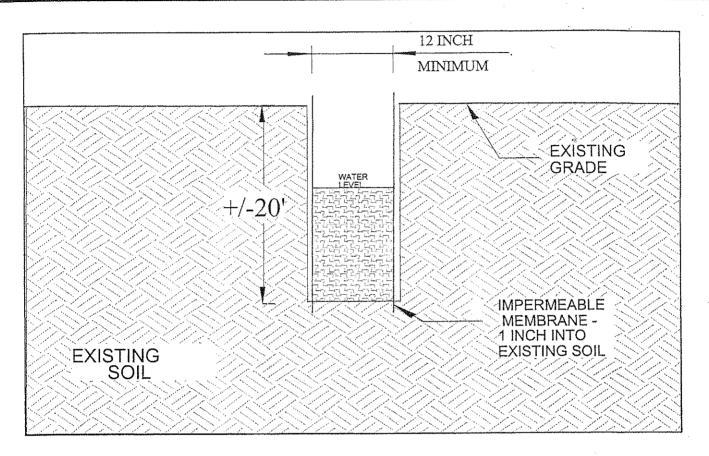
MDE

DATE:

07/19/01

LOCATION:

PT-5 (Near CH-21)



START TIME (Hr:Min)	ENDING TIME (Hr:Min)	ELAPSED TIME (Hr:Min)	INITIAL READING (Feet)	FINAL READING (Feet)	CHANGE IN WATER LEVEL (Feet)	PERCOLATION RATE*
14:22	14:54	0:32	0.32	0.88	0.56	1.05
14:54	15:15	0:21	0.88	1.22	0.34	0.97
15:15	16:21	1:06	1.22	2.26	1.04	0.95
16:21	16:44	0:23	2.26	2.58	0.32	0.84
16:44	17:03	0:19	2.58	2.88	0.30	0.95

<sup>\*</sup> Note: Percolation Rate is reported in Cubic Feet per Hour per Square Foot of percolation area.

AVERAGE PERCOLATION RATE FOR LAST THREE READINGS

0.91



Chandler Heights Detention Basin PROJECT NO .: 600198001 PROJECT:

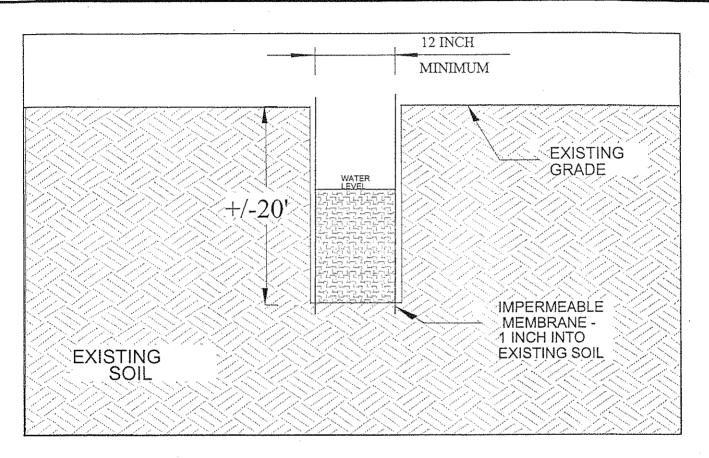
TECHNICIAN:

MDE

DATE:

07/19/01

LOCATION: PT-6 (Near CH-22)



START TIME (Hr:Min)	ENDING TIME (Hr:Min)	ELAPSED TIME (Hr:Min)	INITIAL READING (Feet)	FINAL READING (Feet)	CHANGE IN WATER LEVEL (Feet)	PERCOLATION RATE*
16:37	16:54	0:17	4.54	4.61	0.07	0.25
16:54	17:12	0:18	4.61	4.72	0.11	0.37
17:12	17:30	0:18	4.72	4.82	0.10	0.33
17:30	17:49	0:19	4.82	4.93	0.11	0.35
17:49	18:09	0:20	4.93	5.03	0.10	0.30

<sup>\*</sup> Note: Percolation Rate is reported in Cubic Feet per Hour per Square Foot of percolation area.

AVERAGE PERCOLATION RATE FOR LAST THREE READINGS

0.33



Chandler Heights Detention Basin PROJECT:

PROJECT NO .:

600198001

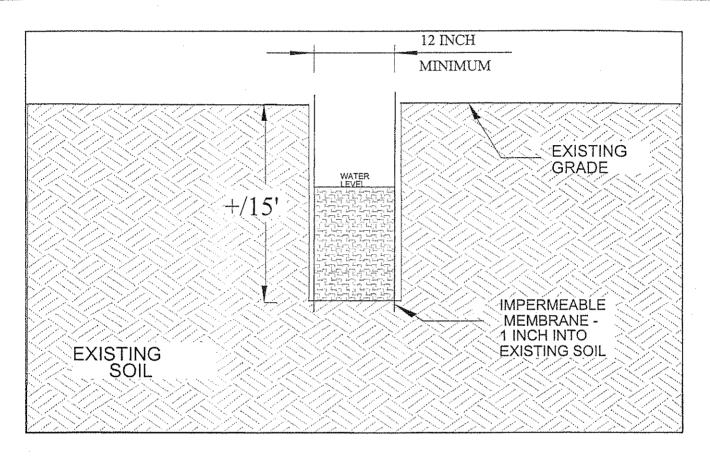
TECHNICIAN:

MDE

DATE:

07/19/01

LOCATION: PT-7 (Near CH-23)



START TIME (Hr:Min).	ENDING TIME (Hr:Min)	ELAPSED TIME (Hr:Min)	INITIAL READING (Feet)	FINAL READING (Feet)	CHANGE IN WATER LEVEL (Feet)	
17:26	17:44	0:18	4.09	4.12	0.03	0.10
17:44	18:02	0:18	4.12	4.15	0.03	0.10
18:02	18:18	0:16	4.15	4.17	0.02	0.08
18:18	18:35	0:17	4.17	4.21	0.04	0.14
18:35	18:49	0:14	4.21	4.23	0.02	0.09

<sup>\*</sup> Note: Percolation Rate is reported in Cubic Feet per Hour per Square Foot of percolation area.

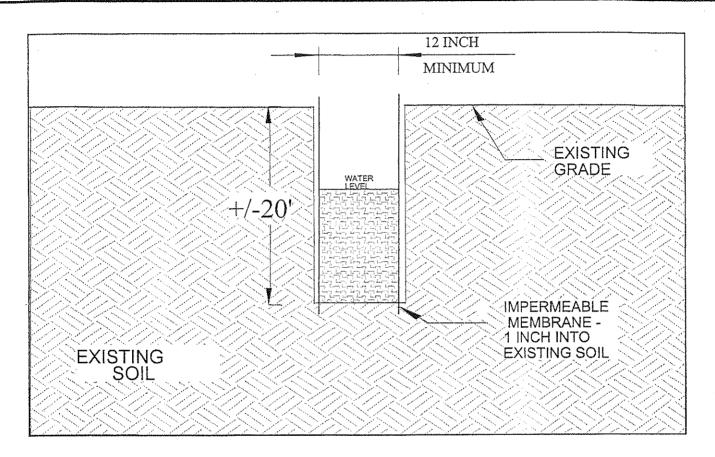
AVERAGE PERCOLATION RATE FOR LAST THREE READINGS

0.10



PROJECT: Chandler Heights Detention Basin PROJECT NO.: 600198001

TECHNICIAN: MDE DATE: 07/19/01 LOCATION: PT-8 (Near CH-24)



START TIME (Hr:Min)	ENDING TIME (Hr:Min)	ELAPSED TIME (Hr:Min)	INITIAL READING (Feet)	FINAL READING (Feet)	CHANGE IN WATER LEVEL (Feet)	PERCOLATION RATE*
14:39	16:28	1:49	0.34	0.89	0.55	0.30
16:28	16:48	0:20	0.89	0.98	0.09	0.27
16:48	17:07	0:19	0.98	1.09	0.11	0.35
17:07	17:20	0:13	1.09	1.15	0.06	0.28
17:20	17:37	0:17	1.15	1.23	0.08	0.28

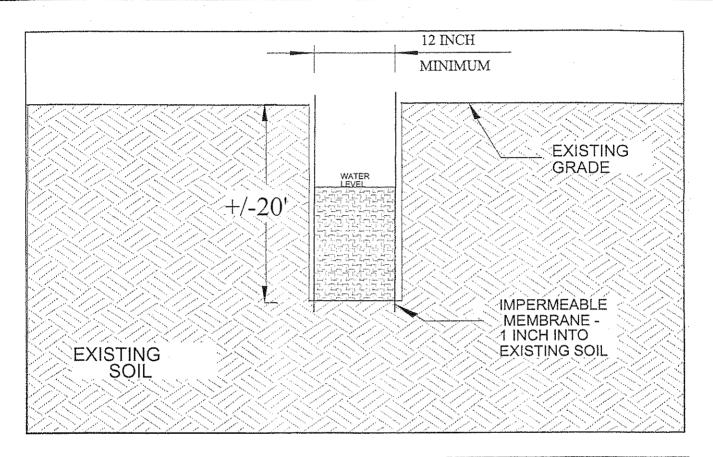
<sup>\*</sup> Note: Percolation Rate is reported in Cubic Feet per Hour per Square Foot of percolation area.

AVERAGE PERCOLATION RATE FOR LAST THREE READINGS 0.30 FT<sup>3</sup>/HOUR/FT<sup>2</sup>



PROJECT: Chandler Heights Detention Basin PROJECT NO.: 600198001

TECHNICIAN: MDE DATE: 07/19/01 LOCATION: PT-9 (Near CH-25)



START TIME (Hr.Min)	ENDING TIME (Hr:Min)	ELAPSED TIME (Hr:Min)	INITIAL READING (Feet)	FINAL READING (Feet)	CHANGE IN WATER LEVEL (Feet)	PERCOLATION RATE*
19:04	19:17	0:13	9.67	9.70	0.03	0.14
19:17	19:30	0:13	9.70	9.73	0.03	0.14
19:30	19:40	0:10	9.73	9.76	0.03	0.18
19:40	19:53	0:13	9.76	9.78	0.02	0.09
19:53	20:07	0:14	9.78	9.81	0.03	0.13

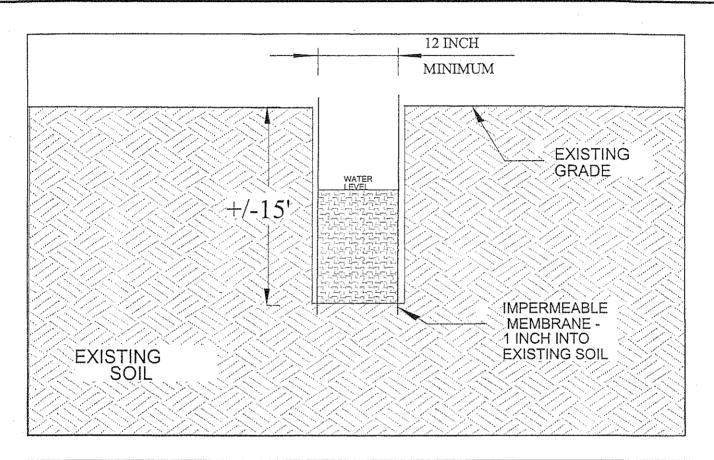
<sup>\*</sup> Note: Percolation Rate is reported in Cubic Feet per Hour per Square Foot of percolation area.

AVERAGE PERCOLATION RATE FOR LAST THREE READINGS 0.13 FT<sup>3</sup>/HOUR/FT<sup>2</sup>



PROJECT: Chandler Heights Detention Basin PROJECT NO.: 600198001

TECHNICIAN: MDE DATE: 07/19/01 LOCATION: PT-10 (Near CH-26)



START TIME (Hr:Min)	ENDING TIME (Hr:Min)	ELAPSED TIME (Hr:Min)	INITIAL READING (Feet)	FINAL READING (Feet)	CHANGE IN WATER LEVEL (Feet)	PERCOLATION RATE
19:10	19:27	0:17	4.13	4.14	0.01	0.04
19:27	19:36	0:09	4.14	4.16	0.02	0.13
19:36	19:47	0:11	4.16	4.18	0.02	0.11
19:47	20:00	0:13	4.18	4.20	0.02	0.09

<sup>\*</sup> Note: Percolation Rate is reported in Cubic Feet per Hour per Square Foot of percolation area.

AVERAGE PERCOLATION RATE FOR LAST THREE READINGS 0.07 FT<sup>3</sup>/HOUR/FT<sup>2</sup>

#### APPENDIX D

AGRONOMIC TESTS RESULTS



### ANALYTICAL CHEMISTS

August 21, 2001

Lab #: SP 107342-03

Ninyo & Moore 5035 South 33rd St. Phoenix, AZ 85040

### Recommendations for Chandler Heights Basin

The following report presents the results of analyses conducted on your soil. See page 4 for sample information and analyses results. The following recommendations are based upon the current conditions of the soil. All application recommendations are for each 1,000 square feet of growing area. Please be sure to read the standard application notes presented on page 3.

#### I. Plant Selection

II.

The analyses of this soil indicates the following plant selection requirements:

A. Select only non-acidic loving plants for this soil.

B. Select only those plants that have a slight or greater tolerance to free limestone

for planting at this site.

C. Select only those plants that have a <u>slight or greater</u> tolerance to Salinity for planting at this site. A review of the plants growing in the immediate area of the site to be landscaped will provide some additional guidelines as to the proper plant selection.

### Preplant Soil Amendments and Fertilizers

#### A. Turf and Groundcover

			Apply per	1000 sq. ft.
1.	Soil amera. Organb. Limesc. Soil S	nic (well-composted) stone		cu. yds.

2.	Fertilizers	Apply per 1000 sq. ft.
4.	a. Nitrogen (N)	0.00 lbs.
	b. Phosphorus (P <sub>2</sub> O <sub>5</sub> )	4.50 lbs.
	c. Potassium (K <sub>2</sub> O)	2.80 lbs.
	d. Magnesium (Mg)	0.00 lbs.
	e. Zinc (Zn)	1.30 lbs.
	f. Manganese (Mn)	0.00 lbs.
	g. Iron (Fe)	0.80 lbs.
	g. Iron (Fe) h. Copper (Cu)	.025 lbs.
	i. Boron (B)	.000 lbs.

Page 1 of 3

Field Office
Visalia, CA
TEL: 559/734-9473
FAX: 559/734-8435
Mobile: 559/737-2399

LAB No: SP 107342-03

### August 21, 2001

### B. Tree and Shrub Backfill Mix

1.	Native (site) soil	66%
2.	Nitrogen Fertilized Organic Material	33%
3.	Commercial Fertilizer (8-8-4)	1 lb./cu. yd.
4.	Iron	2 oz./cu. yd.
5.	Zinc	1 oz./cu. yd.
6.	Manganese	1 oz./cu. yd.

When planting specifications do not call for a separate backfill mix then backfill the holes that are excavated to install containerized plants using the native (site) soil amended according to the preplant recommendations given on page 1.

### III. Leaching Requirement

It is recommended that this soil be thoroughly leached to lower the Chloride, and the total Soil Salinity prior to preplant planting. This leaching operation should be made after the application of any recommended soil amendments, but prior to applying any of the recommended preplant fertilizers. The leaching operation should consist of three applications of irrigation water with enough water being applied at each irrigation to thoroughly wet this soil to a depth of twenty-four inches with the water being applied at a rate slow enough to prevent any runoff. A two to three day waiting period between applications of water should occur to allow for internal soil drainage.

Chloride, and the total Soil Salinity(ECe) levels should be rechecked after the above leaching operation is completed to determine the degree of improvement. These new levels will allow for the selection of plants having the appropriate salt tolerances.

### IV. Post-Plant Fertilization - lbs./1000 sq. ft.

Nitrogen	3/4	lb.
Phosphorus	1/3	lb.
Potassium	1/3	lb.

The actual post-plant requirements for fertilizers and soil amendments will vary depending upon the specific site conditions. Periodic post-plant analyses can be used to assure proper soil conditions and balanced levels of plant nutrition.

### V. Irrigation

Make certain that the irrigation water being applied is penetrating to a depth slightly greater than the root zone of the plants being grown. Water with a frequency needed to maintain moist soil at all times - never wet for long periods and never let the soil dry out.

### **Application Notes**

The application instructions listed below apply only if the material(s) is recommended in this report on page 1. Materials not included in the recommendations are excluded either because the analyses data did not indicate a need or the analysis to determine if a need existed was not requested.

### Organic Materials

Nitrolized redwood compost is preferred but other organic mixes may be substituted depending upon the site requirements. Organic materials should be spread uniformly over the surface soils and when possible should be incorporated to a depth of two to three inches.

#### Limestone, Dolomite & Sulfur

These materials should be broadcast uniformly over the surface soils and then incorporated to a depth of two to three inches.

#### Gypsum

This material should be broadcast uniformly over surface soils for water penetration. For best results do not incorporate.

#### Preplant Phosphorous, Zinc, Manganese, Iron & Copper

These materials should be broadcast uniformly over the surface soils and then incorporated to a depth of two to three inches. Post-plant applications can be surface applied for water penetration.

#### Nitrogen, Potassium & Magnesium

These materials are highly water soluble and can be applied uniformly over the surface soils for water penetration or they can be incorporated with the other materials. Magnesium sources for plant nutrition include Epsom salts (Magnesium Sulfate), and the double salt of Potasium-Magnesium Sulfate (Sulfate of Potash-magnesia).

Page : 3 of 3

### ANALYTICAL CHEMISTS

August 21, 2001

Ninyo & Moore 5035 South 33rd St. Phoenix, AZ 85040

Sampled On: July 13, 2001 Sampled By: Ninyo & Moore Received On: August 15, 2001

: 12-15'

Customer ID: 2-18569

Meth. Irrg.: S.S. Sprinklers

Lab ID : SP 107342-03

Description: CH-13

Project

: Chandler Heights Basin

### LANDSCAPE SOIL ANALYSIS

Test Description	Result	Optimum Range		Graphic	al Results	Presentation	
Primary Nutrients Nitrate-Nitrogen Phosphorus Potassium (Exch) Potassium (Sol)	68.7 PPM ND PPM 130 PPM 0.31 meq/L	10 - 70 12 - 60 81 - 500 0.25 - 1.0	Very Low		Optimum	Moderately High	Very High
Secondary Nutrients Calcium (Exch) Calcium (Sol) Magnesium (Exch) Magnesium (Sol) Sodium (Exch) Sodium (Sol) Sulfate	3900 PPM 18.2 meq/L 240 PPM 4.2 meq/L 130 PPM 10.9 meq/L 5.5 meq/L	2.0 - 50  1.5 - 60  See SAR 0.6 - 20					
Micro Nutrients Zinc Manganese Iron Copper Boron Chloride	0.2 PPM 3.2 PPM 4.4 PPM 0.6 PPM 0.77 PPM 7.91 meq/L	0.7 - 50 1.4 - 50 8.0 - 100 0.2 - 15 0.3 - 2.1 0.1 - 4.0			innerent .		
CEC  **Base Saturation** CEC - Calcium CEC - Magnesium CEC - Potassium CEC - Sodium CEC - Hydrogen	22.3 meq/100g  87.0 % 9.0 % 1.5 % 2.5 % 0.0 %	Variable  60 - 80 10 - 20 2 - 5 0 - 5 0 - 3					
pН	7.7	5.8 - 8.2	Strongly Acidic	Moderately Acidic	Near Neutral	Moderately Alkaline	Strongly Alkaline

Good 2

Problem Problem

Table continued next page...

Corporate Offices & Laboratory PO Box 272 / 853 Corporation Street Santa Paula, CA 93061-0272 TEL: 805/659-0910 FAX: 805/525-4172

Office & Laboratory 2500 Stagecoach Road Stockton, CA 95215 TEL: 209/942-0181 FAX: 209/942-0423

Field Office Visalia, CA

TEL: 559/734-9473 FAX: 559/734-8435 Mobile: 559/737-2399

August 21, 2001

Ninyo & Moore

Lab ID

: SP 107342-03

Customer ID: 2-18569 Description: CH-13

### LANDSCAPE SOIL ANALYSIS

Test Description	Result	Optimum Range	Graphical Results Presentation								
Others			Satisfactory			Possible Problem		Moderate Problem	Inc P	Increasing Problem	
Soil Salinity SAR Limestone	2.94 mmhos/cm 3.3 1.1 %	0.5 - 2.0 0.1 - 6 0 - 0.1				]					
			0	1		2	3	4	5	6	
Lime Requirement	0.0 Tons/AF										
			Very Low	N	Moderately Low		Optimum	Moderately High		Very High	
Moisture	3.1 %	1/2 Satn. %							Whiteleaster		
			Loamy Sand	Sanc Loa		Loam	Silt Loam	Clay Loam	Clay	Organic	
Saturation	29.2 %	20 - 60									

Good Problem

Soil pH & Limestone levels are important to consider when making plant selections. Soil pH levels above 7.0 are not suitable for acid loving plants. Soils containing limestone are not suitable for plants sensitive to Limestone.

FRUIT GROWERS LABORATORY, INC.

DHN:md

Darrell H. Nelson, President